

THE PROBLEM OF TIME

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THE ORDER OF TIME

BY

STEPHEN C PEPPER

THE ORDER OF TIME

STEPHEN C. PEPPER

IN THE PHILOSOPHY OF PRAGMATISM (or, as I prefer to call it, contextualism) there is a serious problem that has not received the attention it deserves. I refer to the problem of the structure of experience—"experience" meaning what it generally means for a pragmatist, the stuff of nature, or, if you will, nature itself, or the universe, or whatever is. The pragmatist of the past up to and including Dewey has been mostly concerned with a theory of knowledge and with the use of that theory of knowledge as a polemical instrument for the discomfiture of his philosophic rivals. He has been clearing a place for himself in the philosophic world by attacking and threatening his enemies with weapons that have proved stout enough. But he has done little in the way of examining the character of the ground he has cleared. He has undoubtedly had enough to do in the past to teach his enemies to respect him, and he has still something to accomplish on this score, but today he can feel himself more at peace than ever previously and is able to devote himself, and is devoting himself, in some degree to an intensive cultivation of the soil he has conquered.

The book that presages this new era of pragmatism bears the title, startling to the old-time pragmatists, *The Metaphysics of Pragmatism*. This book is to a large degree concerned with the structure of nature. Sidney Hook, the author, states his concern with the problem explicitly at the beginning of his third chapter.

It will be remembered [he writes] that this is an investigation of that sign function of the instrument which is expressed not in a report of the needs and purposes it subserves, nor in a description of the particular character of its symbolic medium, but in an analysis of the *structure of the field* of inquiry in which the instrument operates *

strumental nature of knowledge, and with a description of the nature of the instrument—both epistemological questions. This present emphasis of Hook's on the structure of the field within which knowledge operates, is something new in pragmatism. But his new concern of pragmatism bristles with difficulties.

It is with this new concern of pragmatism that I wish to deal in this paper. I shall first attempt to give a description of the difficulties, and then I shall try to see what can be done about them within the limits of the ultimate contextualistic presuppositions or categories. I shall use the order of time—that is to say, the time of physics and of the common man who keeps dates—as a concrete and typical example of the source of the troubles involved. If the contextualist can give an adequate account of the order of time, there is no reason to suppose that he could not give an adequate account of any structural feature of nature.

Before entering upon the details of this problem, I must direct attention to two general considerations, which, if not understood now, might lead to future misunderstandings. First, it is evident that if there is to be any metaphysics at all, or indeed any knowledge (or even error) of any kind at all, there must be some degree of structure in stuff or nature. Not that a man might not play the utter skeptic, keeping dogged silence, or persistently talking nonsense, or acting without discrimination. A man in that state, I suppose, is theoretically invincible. But for the rest of us who do talk sense, communicate with one another, and make discriminations in nature—and for the skeptic himself as soon as he comes out of his fit—the world has some structure. Meaning and the discriminating activity involve structure in themselves. A structureless flux is out of the question, by the very fact that I can write this sentence and say so.

Second, it must be observed that the process of thought is itself a natural process, and that whatever structure thought has is itself a structure in nature or stuff. It is important to notice this, because as an outside possibility it might turn out that the only structure a contextualist should find himself justified in affirming would be a structure of thought. But even if this should be the most he could affirm, he would still be attributing a structure to nature; and might, though going no farther, develop a fairly adequate

philosophical theory. What is more likely to appear, however, is that thought structures will have a continuity with structures not properly called thought, and that there will be a limbo of natural structures that cannot be fitly called either thought or not-thought. Our minds must be nimble and ready for anything in the solution of the problem we are about to encounter.

And now let us go out and meet the problem. In my paper of last year, which was also along contextualistic lines and concerned with the problem of time, I distinguished between two sorts of time—the time of the specious present and schematic time. The time of the specious present is the immediately felt duration of strands of texture with tensions toward what we call the future and out of what we call the past. There is obviously structure in any given specious present. Furthermore, specious presents overlap, and share parts of one another's structures, and thus develop an interlocking structure of specious presents. So far there is no difficulty.

The first sign of difficulty comes when we begin to make somewhat extensive predictions into the future. When I make an engagement with somebody else for a date some days hence, then I seem to be implying something that extends beyond the structure of any given specious present, and even beyond any existing structures. For it is a categorical tenet of pragmatism that the past is really gone and the future really not here, so that change may really be change, and novelties really novel. A promise for the future, therefore, seems to be a promise shot into the dark without any target or structural frame that it can hit. Then to our relief comes the structure of a calendar. The present day and the future day there find their present representatives as numbers, and a strand of reference can be found in the calendar from one of these numbers to the other. Throughout the week, and as long as the calendar lasts, I am now able to say that on such a number I made a promise (observe the mark) which was to be kept on such another number (observe the other mark). The calendar, as a structural scheme, presents an order of time.

The order of time of the calendar is obviously distinguishable in some sense from the passage of time in present duration. But a further distinction is commonly made between the schematic order of a calendar and a natural order of time which a calendar is said

to represent. Thus, we have three sorts of time to consider and adjust to one another: first, the passage of time, second, a schematic order of time such as a calendar, and third, a natural order of time which a calendar is supposed to represent.

By the way, before proceeding any farther, I must make it clear that by referring to a calendar as a typical example of a schematic order of time, I do not by any means wish to intimate that this sort of order is anything trivial. I merely refer to the calendar in these pages in order to keep something simple and concrete before our minds. I could as well refer to the modern physicist's special theory of relativity. For the special theory of relativity is nothing more nor less than the most accurate calendar at the physicist's present disposal. By means of this theory he can predict the dates of occurrences—that is, keep exact appointments with planets and electrons—with greater security than by means of an ordinary desk calendar. In point of principle, there is no difference between a desk calendar with an appointment to meet a friend next Thursday, and the physicist's most elaborate mathematical formulation of the spatio-temporal field by means of which he predicts a concurrence of physical events. A schematic order of time is any humanly devised instrument for the control of time. Since it is with principle and not with detail that we are concerned in this paper, I shall continue to refer to the calendar as an example of the schematic order of time. But if any one wishes to give to this order the dignity it deserves, he may systematically substitute in his mind "the special theory of relativity" for "calendar," on every occasion that I employ the latter term.

We are faced, then, apparently with three important kinds of time—the passage of time, the schematic order of time, and the natural order of time. I say "apparently" we are faced with these three kinds, for upon further analysis we may find any one of these kinds of time resolving itself into any one of the others, or even dissolving entirely away. But one thing we can be sure of before we take a step farther, and that is that the passage of time in contextualism will be neither resolved nor dissolved away. This is categorical for contextualism. The theory of contextualism may be explained away and interpreted out of recognition of itself by mechanist, or idealist, and thus indirectly the passage of time may

be resolved or dissolved away. But within the categories of contextualism, the passage of time cannot be explained away, for it is involved in the categories themselves.

It is the categorial impregnability of the passage of time for this philosophy that raises the difficulties with the orders of time, for these do not superficially seem to be compatible with the passage of time. These seem static and permanent, and in contradiction to the transiency of the passage of time. To bring out the problem here, let us imagine these three kinds of time in layers—the passage of time in the middle, the schematic order of time above, and the natural order of time below. Everyone agrees that our ordinary everyday life runs in the middle layer of the passage of time. But everyone except a contextualist insists that this passage of time upon subjection to analysis resolves itself into either the upper or the lower static layer. The idealist tends to carry the passage of time away into the upper layer, the mechanist into the lower.

Speaking of explanation through stratifications, I may generalize. Apart from contextualism, philosophies tend to conceive of the universe as laid down in layers. The Aristotelian has his layers of matter and form, the mechanist his layers of electrons, atoms, molecules, cells, the idealist his degrees of reality. The contextualist, however, conceives of the universe as structured laterally like a fabric. For all other philosophers there is a tendency to explain any troublesome structure in terms of overlying or underlying structures not immediately accessible. For the contextualist, however, an occurrence is regarded as being really pretty much what it is experienced as, and explanation for him lies in examining the context in which the occurrence takes place, its so-called historic background, and its future trends. A contextualist hates to admit the existence of any entities hidden in the bowels of Being. If he cannot find an object in the stream of things going by him and along with him, he is skeptical of its reality. And this skepticism is well based on his categorial groundwork. Not that he cannot admit of a certain degree of vertical structure—on the contrary, every texture has its strands—but that the movement of analysis for him is always sidewise and lengthwise, and not until horizontal explanation utterly breaks down in a field of inquiry does he even consider vertical explanation in terms of hidden en-

tities. Even so, these hidden entities could not be static or eternal, but would have to be of the same texture as that of any surface events, for moving strands must have continuity with, and lead into, surface strands in order that there may be any evidence of them

The orders of time, therefore, must be explained by contextualism in such a way that they are not in conflict with the passage of time—not in any sense static or absolutistic. Yet static or absolutistic seems superficially to be precisely the character of a calendar and of the natural order of time which a calendar seems to represent. Here is where the problem arises. The passage of time must remain in contextualism, whatever may happen to the orders of time. The problem is, what to do with the orders of time. Now, there may be the following contextualistic theories of the order of time—first, that there is no order of time, the skeptical theory; second, that there is but one order of time, the single order theory; third, that there are two orders of time, the double order theory, and fourth, that there are many orders of time, the multiple order theory. Let us examine these one by one. I shall attempt to show that the first three theories are untenable, and that the solution of the problem for a contextualist lies only in the fourth theory, the multiple order theory.

The skeptical theory, that there is no order of time, is untenable, I believe, because it involves the denial of any utility in a calendar. If a calendar were nothing but an aesthetic pattern of lines and figures, the skeptical theory could hold. But the difficulty is that by means of a calendar we can actually keep appointments and bring events to orderly and anticipated convergencies. Whatever the mechanism of this function, the function is surely there. With our whole social life organized as it is from morning to night and from year to year within boundaries of minutes, hours, and dates, it is asking too much of any empirical philosopher to deny that there is some order of time in experience, an order of time that is structurally something more determinate than the general structure of durations in the passage of time. The evidence overwhelmingly indicates an order of time working through and rendering more determinate the structure of the passage of time.

At the very least a contextualist must hold a single order theory

of time. And it is inevitable that this single order should be identified with the calendar itself—not the calendar as a mere visual pattern, of course, but as the complex social institution that it shows itself to be, in its concrete functioning. The single order theory affirms that the order of time is a social institution, and it denies that it is anything else. According to this theory there is no order of time other than the human convention of the calendar. Time is a social instrument for the keeping of appointments—this and nothing more. It is of the same nature as the social institution of price. It is objective enough, just as price is objective. But just as we should not dream of thinking of a physical price underlying, or represented by the price we know as a social instrument by means of which we make exchanges of commodities, so we should not think of a physical order of time underlying, or represented by the social order of time, the calendar, by means of which we make and keep appointments. The social order of time is *the* order of time, and there is no other order of time.

I use the analogy of price intentionally, for it is an analogy which Dewey himself uses in an illuminating passage. Dewey, I believe, vibrates between a single order, and a double or multiple order theory of natural structures. (Remember that the order of time is just one example of natural order in general.) Let me quote the passage from Dewey in which he elaborates this analogy and, so far, commits himself to a single order theory.

The resolution of objects and nature as a whole [he writes] into facts, stated exclusively in terms of quantities which may be handled in calculation, such as saying that red is such a number of changes while green is another [or that a day is twenty-four hours or a symphony forty minutes], seems strange and puzzling only when we fail to appreciate what it signifies. In reality, it is a declaration that this is the effective way to *think* things, the effective mode to frame ideas of them, to formulate their meanings. The procedure does not vary in principle from that by which it is stated that an article is worth so many dollars and cents. The latter statement does not say that the article is literally or in its ultimate "reality" so many dollars and cents, it says that for purpose of exchange that is the way to *think* of it, to judge it. It has many other meanings and these others are usually more important inherently. But *with respect to trade*, it is what it is worth, what it will sell for, and the price value put upon it expresses the relation it bears to other things in exchange. The advantage in stating its worth in terms of an abstract measure of exchange such as money, instead of in terms of the amount of corn, potatoes or some other special thing it will exchange for, is that the latter method is restricted and the former generalized. Development of the systems of units by which to measure sensible

objects (or form ideas of them) has⁵ come along with discovery of the ways in which the greatest amount of free movement from one conception to another is possible *

A little later he adds:

For purposes except that of general and extensive translation of one conception into another, it does not follow that the "scientific" way is the best way of thinking the affair. The nearer we come to an action that is to have an individualized unique object of experience for its conclusion, the less do we think the things in question in these exclusively metric terms †

And still a little later:

There is something both ridiculous and disconcerting in the way in which men have let themselves be imposed upon, so as to infer that scientific ways of thinking objects give the inner reality of things, and that they put a mark of spuriousness upon all other ways of thinking of them and of perceiving and enjoying them. It is ludicrous because these scientific conceptions, like other instruments, are hand-made by man in pursuit of realization of a certain interest—that of maximum convertibility of every object of thought into any and every other ‡

Dewey here takes explicitly the view that quantitative scientific concepts, such as the order of time, are social instruments, created by society to serve a certain social purpose. They are "hand-made by man." Their procedure does not vary in principle from that of commodity price.

In terms of our former three-fold stratifications of time, as the calendar, the passage of time, and an underlying natural order of time, this view denies that there is an underlying order and identifies the order of time with the calendar conceived as a social institution. "There is something ridiculous," says Dewey, in the inference "that scientific ways of thinking give the inner reality of things."

If this single order theory were tenable, it would constitute for the pragmatist an easy solution of the problem of the order of time and of all similar problems of order connected with the natural sciences. But I fear it is not tenable. There is one vital difference between the social institution of price and the social institution of the calendar. The latter may be true or false, whereas the former is a brute social fact. We do certainly speak of mistaken prices, meaning a discrepancy between the price a merchant writes on a

* *The Quest for Certainty*, pp. 134-135.

† *Ibid.*, p. 135.

‡ *Ibid.*, pp. 135-136.

tag and the actual market price. This shows that we have not only the marked price as a brute fact, but also conceptions of that price. The conceptions may, like all conceptions, be true or false. But price itself is a social fact, and is that with reference to which the truth or falsity of one's conceptions of price are determined. The peculiarity of the situation here is that price itself is a social fact and that there is no fact of price other than a social fact.

This is not so with respect to time. A calendar is admittedly a social fact. But the calendar is verified, not with social facts, but with such nonsocial facts as the revolution of the moon, the revolution of the earth about the sun, the flow of sand or water, and the swinging of pendulums. A calendar is a conceptual instrument and is rather like a theory of price than like price itself. To remark that a theory of price has an influence on price itself and that the two are not as distinct from each other as people often imagine, is a good pragmatic remark, and undoubtedly valid within pragmatic categories, but some distinction, nevertheless, remains. And the point of the objection I am raising is that this distinction between fact and concept is one that for price holds wholly within the social field, whereas for the order of time it splits between the social and a nonsocial field. A calendar is a social matter. Granted. But the facts that verify a calendar are, at least in part, nonsocial matters.

To put the situation in a crude way. We can imagine a group of people, who have been living in a social system which did not admit of price, suddenly declaring, "Let's have price!"—much as a group of boys institute "three-strikes-are-out" after some enterprising boy has shouted, "Let's play baseball." But when did any man shout, "Come, let's play the order of time"? Does some pragmatist reply, "Newton"? Note the difference, however. "Price" and "three-strikes-are-out" are created out of the air, so to speak, by men assembling in a certain order. But Newton merely extended and refined a calendar already long functioning. He did not so much create as amend. And his eye was not so much on agreements with other physicists as upon pendulums and the stars. There are, in other words, nonsocial factors involved in the development of a calendar, such as are not involved in the development of "price" or of "three-strikes-are-out." The single order theory of time does not

account for these nonsocial factors. For that reason I regard it as an untenable theory.

We are thus led on to the double order theory. There are passages in Dewey which seem to presuppose this sort of theory also, or possibly a multiple order theory. They are at least passages that contradict the single order theory. A pair of these contradictory passages, I think, are worth quoting, if for nothing more than to show the chaos in which this problem stands in many pragmatic circles. The following passage asserts the single order theory.

The notion that the findings of science are a disclosure of the inherent properties of the ultimate real, of existence at large, is a survival of the older metaphysics.

That is to say, a scientific law is *not* a disclosure of any feature of nature, it is like a price. But then we read:

There is one common character of all scientific operations which it is necessary to note. *They are such as disclose relationships*. [These words are italicized by Dewey himself.] These connections are as much experienced as are the qualitatively diverse and irreducible objects of original natural experiences.[†]

That is to say, now a scientific law is a disclosure of certain features of nature. It is specifically a disclosure of relational or structural features. And note that we must not make anything of the fact that in the one passage it is *properties* of nature that he denies the disclosure of, while in the other it is the *relations* of nature that he declares the disclosure of. For in the second quotation he specifically asserts that "these connections are as much experienced as the qualitatively diverse," and, in fact, it is a categorial pragmatic doctrine that there is no essential difference between a quality and a relation. Here, then, is a flat contradiction. And the whole of *The Quest for Certainty* oscillates between the poles of this contradiction. But, as I remarked, we cannot learn from this or similar passages whether the relations "disclosed" by a scientific law are those of one other order or of many orders of nature. We are left unenlightened concerning whether Dewey intends in these passages to imply a single or a multiple order theory.

We, therefore, turn at this point to Hook, who unmistakably in his *Metaphysics of Pragmatism*, espouses a double order theory

* *The Quest for Certainty*, pp. 102-103

† *Ibid.*, p. 125.

He writes:

Instruments for measuring time, whether it be the flow of sand in an hour-glass or the periodic movements of heavenly bodies, imply an *order* of time, and an order intimately bound up with the movement of things, not with a succession of feelings and affections for which stretches of duration are never equal. Likewise if mechanical appliances enable us to control natural operations and to predict on the strength of what we control, this is possible only in so far forth as there is a *mechanical order* in nature.*

There are thus presented to us definitely such instrumental structures as calendars and hourglasses, and over against these, structures of nature. Hook makes this distinction even more emphatic a couple of pages farther on.

Every instrumental operation, whether it be scientific or artistic, industrial or personal, implies an order to which it owes its existence and an order in virtue of which its ends are realized.†

Now, the danger for a contextualist in admitting a duplication of structure in processes involved in science is that he runs the risk of committing himself to a correspondence theory of truth. There is, of course, nothing inherently fallacious in a correspondence theory of truth. It is an ancient and respectable theory, and the one, I believe, that every mechanist should hold. The correspondence theory of truth is at least as sound as the philosophy of mechanism. But it is not a theory of truth that can be consistently held by a pragmatist or contextualist. The grounds for this inconsistency would take some time to exhibit, but I do not think that for the philosophical public of the present generation there is any need to exhibit these grounds. We are all familiar with them. When pragmatism gives up an instrumental or purposive theory of truth, it is no longer pragmatism.

Hook does, I think, implicitly commit himself to a correspondence theory of truth. It will be worth our while to find out how this happens, because profiting by his mistakes we shall be able perhaps to save the structural features of nature which Hook wants to save without sacrificing the instrumental theory of truth, without which a pragmatism ceases to exist.

Hook starts, as any pragmatist would, with an instrumental account of thought. He then asserts that the function of an instrument is one of selection. It involves, in fact, a double selection

* *Op cit*, p. 36.

† *Ibid*, p. 38.

Among all the theoretically possible ends which an instrument might further, an instrument selects only those which are represented by actual trends in nature. Secondly, among all the trends going on in a specific field of nature, an instrument selects only those relevant to the human purpose which it is to serve.

The instrument in all this is doubly selective [writes Hook]. It seeks to actualize only those possibilities which are natural fulfillments of the state of affairs it begins with; and from among the possibilities which are *naturally* relevant, it selects those that are *humanly* relevant—fulfillments of human preferences.*

This doctrine entails a somewhat limited conception of an instrument. Let me call it the doctrine of the passive instrument. For it appears that the sole function of an instrument is that of selection. On the one hand is the available structure of nature; that Hook recognizes. On the other hand is a human purpose with a structure of its own. The purpose according to Hook is realizable, and realizable only, if it is such that there can be found natural trends in the structure of nature, which can be followed by the desired trends of this human purpose. The function of an instrument is to mediate between the human purpose and the structure of nature by a process of passive selection. The instrument selects the trends relevant to the human purpose, and releases them so that they can converge to produce the end humanly aimed at. The following passage expresses this doctrine of the instrument admirably:

An analysis of the instrument should lay the bugaboo of abstraction, for, if by that is meant the isolation of vector powers and components from a congeries of massed forces and elements, then it can be demonstrated that these disparaged abstractions turn the wheels in mill and factory and stir into motion the giant dynamos of our power plants, all of which enjoy the honorific status of being concrete. Natural sources of energy can only be made available by connecting them in some way with machines. Machines function properly only when they are so constructed that single forces act on the "driver." The required motion in a machine must always be one of an absolutely defined nature, and hence the mechanism must be so organized that it abstracts from the concurrently operating forces always present. These forces acting naturally apart from human intervention give resultant motions indifferent to the needs of man as an animal, even though their wild play presents on occasions an interesting tableau to man as a spectator. As in the case of the field of intricate social relationships, only by artfully playing off one force against another do we finally get the desired result or motion.†

* *Ibid.*, p. 27.

† *Ibid.*, pp. 32-33.

When this doctrine is considered in its bearing upon truth, when, in other words, this instrument under consideration is a hypothesis for the purpose of attaining an intellectual value, we make the astonishing discovery (in a theory that purports to be pragmatic) that the value of the hypothesis depends on its degree of conformity to the structure of nature. We find that Hook is giving us a correspondence theory of truth. Hook asserts, in a genuinely pragmatic manner, it must be granted, that a hypothesis is always instrumental to some human purpose. But when we ask what makes this instrument a good one, we are told that the ground is the selection by the hypothesis (through symbolic reference) of a set of natural trends which if released would produce the desired result. The value of the hypothesis consists in its degree of conformity with the structure of nature. Will Hook reply "This is only because the conformity of the structure of the hypothesis to the structure of nature is a means to the satisfaction of the purpose. The value lies in the satisfaction of the purpose." The gloating exponent of a correspondence theory of truth can answer "But is not the reason for the satisfaction of your purpose, the fact that your hypothesis conforms to nature?" That is all, as an exponent of a correspondence theory, I ask you to admit. I do not see how Hook can withhold the admission. Yet if Hook makes this admission, I do not see how he can avoid a succession of other admissions which will eventually land him in the midst of the mechanist camp. Let me say again, I don't think this would be a catastrophe in itself. But if there were no other way out, it certainly would be a catastrophe for pragmatism, and for the validity of Hook's book.

Now there is a way out, but it is a way that leads necessarily to a multiple order theory. The way out appears evident enough after an analysis of Hook's difficulty. He got into the difficulty as a result of his doctrine of the passive instrument. But the typical pragmatic doctrine would be that of the active instrument. Sometimes, perhaps, an instrument behaves in the purely passive and selective manner which Hook describes. But surely, for a pragmatist, an instrument frequently behaves in an active manner in mediating between natural structures and purposive structures. It does not simply select and release natural forces. It gathers up these forces

into a context, of which this driving purpose is a part, and organizes the whole mass into a new pattern, which runs itself out to a satisfaction potential in its total pattern. Dewey's "price" is a splendid instance of an active instrument. It would be very difficult to show any plausible way in which "price" could appear as a mere passive instrument making a selection among natural forces.

The importance for a pragmatist of insisting upon an active instrument is that when a hypothesis is viewed as active the value of the hypothesis is thrown once more where it should be for pragmatism—upon the satisfaction of the purpose served. For when a hypothesis itself creates the conditions for its verification, it can no longer be said that the truth of the hypothesis consists in its conformity to a previously ascertainable structure. The truth of the hypothesis consists solely in its capacity to serve its purpose. The hypothesis is, of course, revelatory of environmental structures, because the hypothesis is embedded in those structures and creates whatever novelty it has on the basis of those structures; but the hypothesis is not necessarily in any literal sense a mirroring or representation of those structures.

This doctrine of the active instrument must not, however, be taken as an outright denial of the existence of passive instruments. As our criticism of Hook brought out, passive instruments are of such a type as to exhibit by abstraction natural structures present in the environment. On occasion the purpose may be, not to shape the environment for the supplying of a need, but simply to discover what the environment is. In this case a passive instrument would, if possible, be sought. A metaphysical hypothesis is certainly intended to be a passive instrument for the exhibition of the structure of nature. But every philosopher is aware of how difficult it is to construct such an instrument. The instrument is likely to be much too active, and to give results that are other than a mere selection of environmental characters. The characters become distorted by the instrument, and the distortion is very difficult to detect.

To what degree scientific hypotheses are active or passive, it is hard to determine. If the metaphysical hypothesis of pragmatism is a relatively passive instrument (by which I mean a relatively adequate philosophy), then it must be clear that scientific hypoth-

eses interpreted in any literal sense are rather active instruments. That is to say, the structure of the instrument is not such as to reveal without distortion the structure of the relevant environment. This is clear because almost all scientific hypotheses seem to imply a permanence or range of regularity which no contextualistic categories could guarantee. It is this discrepancy between structures of nature, so far as these can be contextualistically discerned, and the structure of scientific concepts, that has led to the typical pragmatic interpretation of scientific concepts as operational. To declare that a scientific concept is operational is tantamount to declaring that it is an active and not a passive instrument, or at least that its degree of passivity is unknown. An operational theory of science amounts to an assertion that the value of science is practical, not metaphysical.

We can now apply these remarks to the order of time. So far as the order of time is identified with a practical tool like a calendar, or with a scientific hypothesis like the special theory of relativity, we may as contextualists safely say that the value of these instruments is operational. They are active instruments and no doubt true, that is to say, they are instruments which serve very well our purposes of keeping appointments of various sorts. They are not to be interpreted as literal disclosures of structures of nature. That is to say, if the purpose of a hypothesis about time were the disclosure of undistorted natural structures, then these scientific hypotheses cannot be regarded as hypotheses of that sort. This seems for the moment to throw us back upon the single order theory, which we thought untenable. But if we bethink ourselves of relatively passive instruments, we see a way out. By means of metaphysical hypotheses, which we believe to be relatively passive, what do we find? We find that according to the contextualistic metaphysical hypothesis there is not so much an order of time in nature, apart from calendars and other such instruments, as many orders of time, each order to be identified with a pattern of change going on in duration. There is not adequate evidence that all these various orders are parts or aspects of one order, but within limits we seem able to bring some of these orders into harmonious relation with one another by means of calendars and the like. This sort of convergence can be performed so often, if need be, that it is

tempting to infer that it could be done always, and that, therefore, the single order of the calendar is an actual state of being now, and to and from eternity. But after the calendar has spread its net over the whole universe in a hypothetical manner we discover that the changing patterns of time have lost their actuality and become rigid and dead. As contextualists, we realize that we have mistaken an active tool for a passive one, and have illicitly imputed structural features of the tool to nature at large. We modestly return to our contextualistic metaphysical hypothesis, therefore, and are content with the identification of this temporal order of nature with the various patterns of change in passing events.

The realization and the acceptance of this state of affairs is what I call the multiple order theory. It recognizes the calendar as a valuable unifying instrument. It recognizes a multiplicity of dynamic patterns in passing events, which are the multiple orders. It sees no reason to assume that all these orders are one order. On the contrary, it sees many reasons for regarding them as separate individual orders. Some of them may amalgamate in nature and create a new, more extensive order—a new habit of nature, to take one of Peirce's terms. Sometimes an amalgamated order may break up into a number of different orders. Integration and disintegration are equally prevalent processes of nature.

A calendar seems to be a mode of integration of temporal orders instituted in social contexts. It is the human means of bringing together a multiplicity of temporal orders for unified human purposes. It is an active instrument and creates an integration of time orders. This order, while it endures, is a genuine order. As such, it is a social order like price. But it differs from price in being revelatory in some degree of the multiple orders, which it has integrated, and which it anticipates that it will integrate. In other words, a calendar is not only an actual integration but also an anticipation of future (and, so to say, past) integrations. Price does not have this anticipatory characteristic, which the calendar has. A multiple order theory of price would be unnecessary and meaningless. But the inherent truth character of a calendar makes a multiple order theory of time necessary the moment the double order theory is shown to be untenable.

Another way to exhibit the difference is to show that price is

purely a social order, a pattern of human dealings, but that a calendar is both a social and a physical order, regulating not only appointments of man with man, but also of man with physical processes

When by means of a calendar a physical process is truly anticipated, then the calendar has actively succeeded in integrating that process with a human time pattern. When, however, a calendar fails to make the anticipated connections, it has failed to make the desired integrations, and the process sought for integration proceeds on its wild isolated way. A calendar integrates time orders into a single complex order so far as it does integrate time orders, but no farther. Whenever a calendar is not actually integrating temporal orders, these orders are not integrated according to the calendar. It follows that a calendar is revelatory of a time order only when it succeeds in integrating it. For if a calendar succeeds in making an integration, then we have evidence that the time order integrated was of the nature anticipated. When, however, a calendar fails to bring about an integration, the calendar cannot be said to reveal anything of the nature of the process sought for integration.

It follows further, that even if at any epoch all temporal processes could be integrated by a single calendar, no evidence would thereby be supplied to the effect that the order of this calendar was the eternal or perduring order of nature. That calendar would merely be the pervasive order of time in that epoch. In another epoch the order of that calendar might fall to pieces. Suppose that all the societies of the world for a hundred years were absolute monarchies, or suppose that for a hundred years all the world were socially organized into an absolute monarchy, would that be any evidence that really to be society is to be absolute monarchy?

All of which is to say that for a pragmatist or contextualist, calendar time is not categorial, nor is it a sheer fiction (the skeptical theory), nor a mere social convention (the single order theory), nor a mirror of a universal physical order (the double order theory). It is to say that a calendar is an active instrument for the integration of multitudinous temporal processes in nature, that in performing this integration it constitutes a social order of great importance, and that in successfully anticipating and draw-

ing in new physical processes into its system it is revelatory of the nature of those processes. This is the multiple order theory of time. An analogous solution, I believe, can be applied to any kind of physical order, and such, I believe, is the proper contextualistic method of dealing with problems pertaining to the structure of nature.

THE SCHEMA OF TIME

BY

V. F. LENZEN³

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I

ONE MAY BEGIN A DISCUSSION of time by asking the question What is time? Now, I take it that one of the results of modern logic is that the analysis of a concept can be exhibited only by stating its relations to other concepts. Thus the definition of the concept of time is expressed by the propositions in which the concept occurs. Accordingly, I initiate this analysis of the nature of time by examining several statements. The statements about time are of two general kinds. We say, for example, that time flows, time flies, time passes. Thus Newton said, "Absolute, true and mathematical time, of itself, and by its own nature, flows uniformly on, without regard to anything external." A second type of statement is that events or processes occur in time. Thus we have two types of definition first, time is that of which we may say that it flows; second, time is that of which we may say that events occur in time. The two modes of expression seem to be inconsistent. The statement that time flows, however, appears to require that it be completed in the form, time flows in time, which is self-contradictory. Hence I shall assume that the second mode of definition is fundamental. The essential characteristic of time is that events occur in time. The proposition that time flows is to be interpreted in terms of the proposition that events occur in time.

Our rejection of the expression "time flows" as a basis for discussion is supported by Mach's criticism of the Newtonian concept. According to Mach, when we say that a thing changes with the time we mean that the conditions that determine the thing depend on the conditions that determine some other thing. For example, the vibrations of a pendulum take place in time when its displacement depends on the position of the earth. Since, however the displacement of the pendulum may be compared with any

other thing, the illusory notion easily arises that all the things with which we compare it are unessential. Indeed, we may neglect outer things entirely, and find that for every position of the pendulum our thoughts and sensations are different.

Time accordingly, appears to be some particular and independent thing, on the progress of which the position of the pendulum depends, while the things we resort to for comparison and choose at random appear to play a wholly collateral part. But we must not forget that all things in the world are connected with one another and depend on one another. . . It is utterly beyond our power to measure the changes of things by time. Quite the contrary, time is an abstraction, at which we arrive by means of the changes of things; made because we are not restricted to any one definite measure, all being interconnected.*

The outcome of the discussion thus far is that time is something in which events occur. Things change in time. Speaking quite generally, we may then say that time is a character of events. As a preliminary basis for a more detailed analysis, I shall classify relevant theories of time in accordance with three principles of division.

First, we may distinguish between the view that time is concrete and the view that time is abstract. According to the first view, time is a character of concrete events, it is a quality or relation of real events. The theory that time is abstract is that time is an abstract background of phenomena, time is a character which exists, or subsists, for the characterization of events, but is independent of events. Thus, simultaneous events are said to occur at the same time; in the limiting case, at the same instant. Time may be thought of as a set of instants which are independent of events in time. We may view these instants as independent qualities or as constituted by their membership in a system. Newton conceived of time as abstract, Leibniz contended that time without real events is merely an ideal possibility.

The second distinction has already been suggested; it is between time as qualitative and as relational. The question is, whether the instants of time are independent qualities or are constituted by relations. Leibniz specifically adopted the relational theory: according to him time is an order of situations, or an order according

* E. Mach, *The Science of Mechanics*, tr. by T. J. McCormack (Chicago, 1919), p. 223.

to which situations are disposed. What is frequently called the absolutistic theory of time is the view that instants are independent qualities.

The third distinction is between absolutistic and relativistic theories; it has arisen only in recent discussion. Is time independent of a frame of reference, as required in an absolutistic theory, or is it relative to the frame of reference?

For Newton, time is absolute and abstract; if we interpret the expression "time flows" so that it accords with our view that time is a character of events, I think we may say that for Newton time is qualitative. For Leibniz, time is absolute in the sense that it is independent of the frame of reference. He strongly upheld the view that time is concrete and relational, for he says that time is the order of succession of phenomena. In one of his letters to Samuel Clarke he characterizes time as an order of situations, which seems to imply that time is abstract as well as relational. But he really views time as concrete in that he states that time without things is a mere ideal possibility. It is frequently stated that the modern theory of relativity was foreshadowed by the relational theory of Leibniz. This is not so, because a relation may be independent of a frame of reference, that is, absolute. In the light of the foregoing preliminary distinctions I may state that in this paper time is viewed as concrete, relational, and relativistic.

Proceeding now to the task of detailed analysis, I recall that the problem of the definition of time is the analysis of propositions in which the concepts of event, process, and time occur. The fundamental proposition is that events occur in time, or, more specifically, that events are simultaneous or successive in time. An alternative formulation is expressed by the proposition that things endure and change in time. We may, however, analyze a thing into a complex of events. The change of things is then to be described as a succession of dissimilar events. The endurance or persistence of a thing resides in the similarity between the events of a series. An understanding of time thus requires an understanding of the concepts of event, simultaneity, and succession of events. Time may be described as the order of simultaneity and succession of events. Time has also been characterized as eventness or the quality of passage. But this language is to be interpreted relation-

ally. The quality of eventness or passage expresses the property of events standing in a relation of succession. Events originate and pass in time.

Thus time is the order of simultaneity and succession of events. An event is in time, means that it stands in the relations of simultaneity and succession to other events. With this general result as a basis we must now make the concept of time more definite. To that end let us then consider events of brief duration. As the duration of an event is made less and less, the temporal position of the event approaches a definite instant in the time order. Thus we may conceive of the time order as a system of instants, an instant is the temporal position of an instantaneous event. Now there is obviously an element of extrapolation in the construction of the concept of instant. Experience reveals to us events of brief duration, but we are not able to experience events whose duration is as short as we please. In the process of finding briefer and briefer events we come to a lower limit below which we cannot go. As Mr. Whitehead has pointed out, we do not know if the limit of a decreasing series of events exists. We are not acquainted with instantaneous events which would serve to define a correlated instant. Thus in the process of constructing the concept of a time order of instants we must go beyond experience. Accordingly, we conceive of an ideal order of time which consists of a continuous series of instants. Very brief events approximate to instantaneous events which occur at precise instants in time.

As I have remarked, the concept of time as an order of instants has been criticized because there is no empirical evidence that an instantaneous event exists. There is no concrete basis for the definite instant. Attempts have been made to overcome this difficulty, notably by Mr. Russell and Mr. Whitehead. Mr. Russell assumes the concept of extended events which overlap; he defines an instant as an appropriately defined class of overlapping events. Thus an instant is a logical construction. Now there seem to me to be two objections to the foregoing procedure. The first is that the construction of the definition is controlled by the concept of definite instant. From the theoretical point of view the concept of instant is adequate without its construction out of other elements. The concept of instant is defined by propositions such as the prop-

osition that the relation of succession between instants is an symmetrical and transitive relation. The principal objection to the method of extensive abstraction, however, is that the overlapping events must have definite properties in order that they may be used for the logical construction of a precise instant. But there is no empirical evidence that such sharply defined events are to be found; the boundaries of real events are vague and indefinite. Thus the definition in terms of overlapping events makes use of concepts which transcend experience just as does the concept of instant. One might say that the definition of an instant in terms of overlapping events presupposes events which begin and end at definite instants. In Mr. Whitehead's definition of instant the fundamental concept is that of duration, which is a slab of nature having the quality of passage. He considers an abstractive set of durations which consists of the continuous series of durations in which the predecessors extend over their successors. An instant is defined in terms of such abstractive sets of durations. But such abstractive sets which will serve to define instants must have definite properties which are only defined by a set of postulates and are not definitely exemplified in experience.

Thus we cannot construct a theory of time such that the concepts of the fundamental elements, whether finite events, durations, or instantaneous events, are definitely exemplified in experience. It is desirable, therefore, to choose the simplest possible theory, this theory employs the concept of instant as fundamental. Instants are entities which form a continuous linear series. Thus the formal theory of time is expressed by the postulates which define the properties of the linear continuum. The intuitive quality of the time order is to be apprehended in the experience of one event's succeeding another. The temporal relation of succession is thereby given in experience. The postulates then define a precise order with the relation of succession as a fundamental element. The fundamental temporal relation is exemplified in experience; but the definite and detailed structure of the continuum of instants which is defined by the postulates is an object of thought which cannot be entirely exemplified in experience.

Experience reveals a world of events which are simultaneous and successive. On account of the indefiniteness of real events the

temporal relations between them are often vague and indefinite. Thus, we may abstract an indefinite concept of time from experience. But by our postulates for the linear continuum we define a precise concept of an order, or system, which we may think of as extended throughout the world of experience as a framework for the definition of the time of events. Thus, the definite order of time is a schema or frame which is introduced into phenomena by us. The schema of time is tied to phenomena by correlating striking real events with instants of the schema.

II

The preceding discussion may be called a topological analysis of time. We must now turn to the metrical theory, the theory of assigning numbers to point events in accordance with a scale. The metrical theory of time is an account of the presuppositions and method of assigning these numbers to events, the numbers are called the times or dates of the events. If a process begins with a given event and ends with another definite event, then the difference of the times of these events is a measure of the duration or time of the process.

Now a time system, or schema for assigning numbers to events, must be extended throughout time and also extended throughout space. I shall consider the first problem by itself, it may be called the problem of local time, the problem of the extension in time of a system of assigning numbers to events which occur in the same place. The sequence of events at a point may be represented by a line and our problem is to explain the method of assigning numbers to the points on the line. Conversely, there is the problem of finding the position of an event on the line.

The metrical structure of local time is based upon some concrete periodic physical process. The time system is embodied in the behavior of some clock; a definite clock is a concrete realization of a time system. A selected physical process thus serves to introduce a time scale into the world, it is the basis of a coordinate system, of a metrical schema of time. Now, various physical processes can be used for the definition of a time coordinate. The rotation of the earth about its axis, the revolution of the earth around the sun,

the earth—these are physical processes which serve for the definition of a metrical time system. At this moment I am not interested in the standard system, but in the methodological assumptions.

Let us then assume, for example, that the fundamental temporal process is the vibration of a pendulum. The fundamental assumption is that successive vibrations of the pendulum take equal times. It is meaningless to ask whether this assumption is true or false; it is a definition of equal intervals of time. The question of the truth or falsity of the assumption would presuppose another standard, and for this standard one would have to assume that each performance of a periodic process requires the same time. But the fundamental assumption is not made without an empirical basis. In the first place, we have a qualitative estimate of the duration of processes. Thus, one may judge that the time of one vibration of a pendulum on the earth is less than the time between the rising and the setting of the sun. Similarly we may estimate that two successive vibrations of a pendulum take the same time. Our definitions must not contradict our qualitative judgments. One might contend, however, that our qualitative judgments in turn imply a reference to a standard. Thus, it may be that one almost unreflectively adopts one's breathing or pulse as a standard clock, that is, we may assume that we breathe, or that the pulse beats, periodically. I do not think that this is a good explanation, however, because without recourse to a clock one can tell whether one's breathing or pulse is fast or slow. Whatever be the basis of our qualitative estimates of time, it is an interesting fact that the pulse was used by Galileo to determine that the period of a pendulum is constant. In the present stage of science, however, we would time the pulse by reference to a pendulum clock as standard.

In the second place, the definition of a time system in terms of the vibrations of a pendulum has an empirical basis in that all pendulums which are similar in structure vibrate in synchronism, that is, they keep the same time. If two pendulums of equal length are released simultaneously they vibrate together so that they pass through corresponding points simultaneously. Thus the time coordinate may be defined by any one of a set of similar pendulums. One may say that the definition of a metrical time system may be in terms of the law that the period of a pendulum of definite struc-

ture is a constant. This law has an empirical foundation, as we have seen, but in the form in which the time coordinate occurs, the law is an assumption, or postulate, which defines the time. The selection of this process with its law as the definition of time is a matter of convention.

Let us now suppose that we have chosen a particular physical process, for example, the vibration of a pendulum, for the definition of a time system. We select the beginning of a particular vibration as the origin; to the ends of successive vibrations are then assigned the numbers 1, 2, 3, etc. The periodic motion of the pendulum is then the physical basis for a time coordinate system. The time of any event is expressed by assigning the number which is correlated with the vibration whose end is simultaneous with the event. If the end of the vibration and the event are not simultaneous, we may imagine clocks with shorter and shorter periods and thus by interpolation approximate as accurately as we please to a precise assignment of time to the event. The duration of a process is, then, expressed numerically by the difference of the times of its beginning and end.

The preceding discussion implies that time is an order which is implicit in physical processes. The structure of time is manifested in the behavior of structures which are called clocks. The metrical theory of time is determined by the behavior of clocks, since we use a method of assigning the time coordinate which is adapted directly to the clocks which have been chosen. Hence, one appears to be justified in asserting that the concept of time is an abstraction from temporal processes. But this assertion is limited by the circumstance that we have a choice in the physical processes which may be used for the construction of the time coordinate, and by the fact that the exact schema of a linear continuum is not exemplified completely in experience. Thus, the concept of time is not merely an abstraction from experience, it involves conventional and ideal elements which are adapted to experience.

Having established the relation between physical processes and a time system, we must now specify the conditions more precisely. Our fundamental assumption is that a specific process is periodic. But it has not as yet been emphasized that the periodicity is de-

lum is constant, that is, successive vibrations mark off equal times, only if the surrounding conditions are constant. For example, the earth's gravitational field must remain constant, the action of electric and magnetic fields must be negligible, the temperature must be constant, etc. Our definition is applicable only if the conditions are reproducible. The initial procedure is to estimate qualitatively that conditions are the same. Thus, on Monday I measure time with a pendulum of a given length under the usual conditions of the environment. On Friday I measure time with a similar pendulum and assume that the conditions are the same as before. For ordinary work such estimates will be adequate, but for refined quantitative observation the conditions must be quantitatively defined. For example, we may include in our definition the condition that the electric and magnetic fields are zero. Now, the definitions of electric and magnetic fields are in terms of the concept of force, which in turn is defined in terms of acceleration, which in turn is defined in terms of time. We seem to have fallen into a contradiction: in order to define the conditions under which we can use a clock to measure time, we must already know how to measure time. The solution to this apparent contradiction is found in the method of successive approximation. We define the conditions of applicability of physical concepts by successive approximation. The procedure is as follows. We have initially a qualitative estimate of constancy of conditions; for example, we may say that the conditions on Monday and Friday were the same, so that a specific pendulum kept the same time on both occasions, by definition. With this definition of time we can define acceleration, force, electric field, and related terms, quantitatively. We can then use these quantities to define quantitatively the constancy of conditions for the clock. The time kept by the clock would then be defined to a second approximation. Definitions to the first approximation are the basis of definitions to the second approximation.

In practice we may not be able to control the conditions to which our clocks are subject. If we have a quantitative description of the actual conditions, however, we may correct the time assignments made in terms of the actual clock and thereby express the time which would be indicated by a clock for which the conditions were constant. The earth is the standard clock for astronomical meas-

urements, the definition of time being given by the assumption that the angular velocity of the earth about its axis is constant. Now, certain anomalies in the moon's motion can be explained on the assumption that the earth is slowing down on account of tidal friction. This explanation presupposes the laws of mechanics which have been verified on the assumption that time is measured by the rotation of the earth. But then the rotation of the earth would define an approximate time. We may say, however, that time is to be defined by the rotation of the earth—assuming that there are no frictional forces. The empirically indicated time is to be corrected in order to find the time which would be indicated by an earth without friction. But the astronomer does not actually compute the correction from the friction and the laws of mechanics. The correction is obtained by comparison with the moon and is explained in terms of the laws of mechanics. Nevertheless, this illustration shows how the presence of disturbing conditions may lead to the correction of indicated temporal coordinates.

Thus far I have assumed that the time system is defined by a definite physical process, for example, the vibration of a pendulum. In the historical development, however, different processes have been employed for the measurement of time. It will be instructive to consider some of the processes that have been employed and to examine what determines the choice of one process rather than another. The ancients measured time by the motions of the heavenly bodies. They also measured time by an hourglass; a definite amount of sand runs out of the hourglass in a definite time. Now these two methods of measurement agree approximately, the fundamental empirical fact is that there is a definite correlation between the running out of sand and the motion of the heavenly bodies. Hence, two times which are equal as measured by an hourglass are equal as measured by the motions of the heavenly bodies. But the two methods of measurement agree only approximately. The measurement of duration in terms of the motion of heavenly bodies is more precise than the measurement with an hourglass. We take account of the discrepancy by choosing the astronomical method as the standard, the lack of precision of the hourglass is attributed to lack of constancy in the conditions. Thus

principle of causality If deviations from a causal law are observed, they are attributed to some disturbing influence. Such an explanation remains hypothetical until we find the disturbing influence by a more direct method. In the example of the hourglass we can reduce discrepancies in the time of flow of sand to observed differences in the size of the grains, smoothness of surfaces, and other properties. That is, the discrepancy between hourglass time and astronomical time is explained by the fact that differences in the conditions of the grains of sand influence the motion of the grains, and not the motion of the heavenly bodies. Why do we use the former and not the latter explanation? The answer is that we can explain the deviation of the hourglass from the astronomical clock by accepted physical laws, but we cannot explain the action of the sand upon the heavenly bodies in terms of assumed physical laws. The positivistic theory is that the choice of our concepts is guided by a principle of greatest simplicity. We choose our definition of time in order to express physical laws in the simplest possible form. Now, while I recognize the employment of such a principle of simplicity, it seems to me that we definitely employ a principle of causality. When the question is raised of the appropriateness of a measure of time, we approach the problem with a set of physical laws. We abandon one clock for another because we can explain deviations of the first clock in terms of observable causes in accordance with assumed causal laws. It may, of course, be contended that the principle of causality is an illustration of the demand for simplicity.

Another interesting historical example of a clock is the pulse. An important item in the history of physics is the discovery by Galileo that the period of a pendulum is constant. He discovered this law by measuring the period of vibration of a lamp in a cathedral, using as a clock his pulse. In so doing he postulated the law that the pulse beat is constant. At the present day we take it for granted that the pulse beat is variable. It is variable, however, with respect to time as defined by a pendulum or the motion of the earth. Now, why could we not use the pulse as a standard clock? The answer is that in the first place the pulse beats of different people do not agree, whereas pendulums of the same length swing together. Again, the variations of the pulse beat are correlated

with conditions in the body and are thus explained in accordance with the principle of causality. Certain kinds of illness raise the pulse beat. If we insisted upon using the pulse as a standard clock we would have to assume that illness in an individual can affect the motion of the heavenly bodies, which would be contrary to our accepted modes of physical explanation.

I shall summarize the preceding discussion by reviewing the considerations which determine the choice of a standard clock. In the first place, one seeks a process that is as permanent as possible, the rotation of the earth and the motion of the moon especially satisfy this requirement. A pendulum is satisfactory because it is readily reproducible. Furthermore, the clock is to be as free as possible from disturbing influences. The clocks on the earth are subject to disturbances, hence the astronomical clocks are preferable. We do, however, use secondary clocks that are standardized with respect to our astronomical standard.

Most desirable of all for a definition of time, however, is independence of special properties of matter. A pendulum requires the earth's gravitational field, the mainspring of a watch is dependent upon the elastic properties of a particular substance, the heavenly bodies are subject to destruction. The preferred definition is in terms of the functional relations between physical quantities, which are relations expressing physical laws. Thus, we may define time as the independent variable in the equations of mechanics. Time is to be measured so that mechanical laws are satisfied. The laws then constitute an implicit definition of time. In particular, time may be thought of as defined by the first law of motion, which is that a body acted upon by no forces moves in a straight line with constant speed. By definition, equal times are marked off by equal distances passed over by a body under no forces. This definition of time in terms of the first law achieves the dissociation of the definition of time from special processes or special bodies. The change in definitions illustrates what I have called the method of successive definition. Initially physical quantities are defined in terms of special operations. General laws are then discovered by experience and are formulated in terms of the defined quantities. Fundamental laws are then transformed into definitions of the physical quan-

that the measure of a quantity which is obtained by special operations approximately satisfies the definition of the quantity in terms of the fundamental laws. Thus the measurement of time by a pendulum approximately satisfies the definition of time in terms of the first law of motion.

III

Thus far, the discussion has been restricted to the time system at a definite place in space; we have considered only the theory of local time. I now turn to the problem of the time system throughout a space. If A and B are two separated points in space, how are we to construct a time coordinate system at B which is the same as the system at A ? How do we introduce a metrical schema of time which extends throughout space? The answer is that we must postulate a law of connection between local times.

Initially, we shall refer the points of space to a definite frame of reference, the later consideration of other frames of reference creates the problem of relativity. Accordingly, all the points that we shall first consider are fixed with respect to our frame of reference. I shall further assume the possibility of placing a clock at rest at any point in the space of our frame of reference. We shall also speak of similar clocks, for example, pendulums of the same length. The problem now is, Given the time system at a given point A , how shall we extend this time system to B ? We may proceed as follows. Suppose that we have given at A a set of similar clocks. From previous considerations we know that they run synchronously, if each clock is fitted with an indicator which moves over a scale, simultaneous readings of all the clocks will be the same. The clocks are then said to keep the same time. Now, suppose that one of the clocks is moved slowly to point B ; we may then postulate that the clock at B is synchronous with the clocks at A . But we have no direct verification of the synchronism as we have when the two clocks are in the same place. Our assumption is a definition by which we extend the time system at A to the point B . There is, however, empirical justification for this definition. Suppose that one transports two clocks from A to B ; if they are synchronous at A they will be found to be synchronous at B . This experimental result is found even if the two clocks are transported along different paths. Again, if a clock which is synchronous with the clocks at A

is transported and then returned to A it will again be synchronous with the clocks at A . All these experimental results, which may be expressed without using the complete concept of time, suggest the assumption that a time system is extended throughout space by the slow transport of a clock. This method of extending a time system is certainly employed in practical life. Thus, the locomotive engineer extends along the track the time system of the place at which he sets his watch. If a ship carries a chronometer, it extends a time system along its course. In transporting a clock we must not, however, unduly accelerate and disturb it. But the accelerations to which ordinary clocks are subject are not sufficient to disturb the clock. Within the range of ordinary mechanical phenomena we have an empirical basis for our assumption that the time kept by a clock is not disturbed by its slow transport. The assumption has an empirical basis, but in the last analysis it constitutes a definition by which we link the local time of A with the local times of distant points. One is tempted to ask, Does the clock really keep its rate upon transport? From our point of view this question would have meaning only with respect to the time system constructed by the transport of some other clock.

A second method of extending a time system employs light signals. This method is to be preferred over that of transport and has provided the basis for the relativistic theory. At time t_A as indicated by the clock at A we send a signal which arrives at B at the time $t_B = t_A + \frac{s}{c}$, where s is the distance between the two points and c is the velocity of the signal. Accordingly the clock at B is set to read t_B . It can be experimentally verified that if the two similar clocks at A and B initially indicate the same time, they will continue to indicate the same time. This means that if at some later time t_A we send another signal, it will arrive at B when the clock there indicates $t_B = t_A + \frac{s}{c}$. The experimental test of the synchronism of the two clocks presupposes the assumption that the velocity of the signal is constant. If we assumed that the velocity of the signal changes, the agreement between the calculated value and indicated value of t_B would mean that the clocks were not keeping the same time. The assumption of the principle of the constancy of the velocity of light is thus a definition by which a time system is extended throughout space.

It might be contended that the principle of the constancy of the velocity of light is not a definition, but an experimental principle, for the velocity of light has been measured and found to be constant. In the experiment, however, one measures the time it takes for the light to go from a given point to a mirror and then back to the starting point, so that a clock at the starting point is sufficient to determine the time. But this experiment yields the average to and fro velocity of the light. It does not prove that the velocity from A to B is the same as that from B to A . We make this assumption on the basis of the experiment, however, because we assume that space is isotropic—that it has the same properties in all directions. Or rather, our concept of the isotropic nature of space is partly expressed by the assumption that the velocity of light is the same in all directions. In order to measure the velocity of light in a given direction one would have to note the time of its departure from a given point, say A , and note the time of its arrival at B . But then the clocks at A and B would have to be synchronized by an independent method, for example, by the transport of a clock from A to B . No one has attempted this, for the disturbances would be too great and the results would not be consistent. We seek a method of representing nature so that numerical assignments will be reproducible. We may interpret this demand as an expression of a hypothesis of determinateness or a goal of definiteness of representation. For the approximate reproducibility of measurements on ordinary mechanical phenomena we may extend a time system throughout space by the slow transport of a clock. The possible precision of measurement for optical phenomena demands the employment of light signals. Thus the principle of the constancy of the velocity of light becomes the definition of a schema of extended time.

IV

Our schema of extended time has been defined only with respect to a specific frame of reference. We further need to investigate the relation of the schema to several frames of reference. This subject introduces us to the problem of the absoluteness or relativity of time.

Given a frame of reference K in which time is defined in terms of certain stationary clocks which have been synchronized by

transport or by signals. Let K' be a frame which is moving with uniform rectilinear motion with respect to K . In K' there is a set of clocks, at rest in K' , which define a time system in K' . The local times of K' are correlated by the same methods as in K ; thus, if we transport a clock slowly from A to B we extend the time system of A to B . I shall also assume that when the origins of the two frames coincide, the corresponding clocks in the two frames both indicate zero. We may now state the relation between the time systems of the two frames.

In classical mechanics the schema of time is assumed to be the same in both frames. That is, at any time the indication of a K' clock will be the same as that of a K clock, in particular, the indication of a K' clock will be the same as that of a K clock which is opposite to it. Let an observer in K observe the clocks of K' that are moving past him with uniform velocity. He will find that the K' clocks indicate the same readings as his own clocks. We express this fact by the transformation equation $t' = t$. The relation between the time systems of the two frames is expressed by the statement that in classical dynamics time is absolute. There is a single time system which is the same for all observers who are at rest on a permissible frame of reference. In the representation of physical phenomena a schema of time is used of such a kind that the time coordinate is the same in all permissible frames of reference.

Now, the verification of the absolutistic theory of time in the classical mechanics did not proceed in the direct manner which has just been described. Certain transformation equations were assumed: the equation $t' = t$ was one, the others were for the space coordinates, that is, $x' = x - vt$, $y' = y$, $z' = z$. This set of equations is called the Galilean transformation, the equations enable one to obtain the description of motion relative to K' from the description relative to K . Furthermore, having found the laws of motion in K , one can transform them to K' . The outcome of the transformation is that the laws of classical mechanics are invariant under a Galilean transformation. This result agreed with experience; if mechanical experiments were performed on a platform which was moving with uniform rectilinear motion with respect to the earth, which is approximately a permissible frame, the same

absolutistic theory of time was supported by the verification of the invariance of the laws of mechanics under a transformation of permissible frames. In principle, however, it was possible to verify the theory by direct observations on clocks in systems moving with respect to one another. The classical mechanics was based upon an absolutistic theory; in the special theory of relativity Einstein introduced a relativistic theory of time.

The meaning of relativity may be exhibited by describing a hypothetical experiment. As before, K is a frame of reference with appropriately distributed clocks which keep the same time in accordance with our definitions. K' is a frame of reference which is moving with uniform rectilinear motion with respect to K . At the origin of K' is a clock, and I shall suppose that as the clock K' passes the origin of K the hands of both clocks coincide with the zeros of their scales. Now, according to the special theory of relativity, as the clock K' moves past the clocks of K , the indication of K' will lag behind that of the opposite clock on K . For example, when the clock K indicates 6, the hand of clock K' coincides with the mark 5 on its scale. The greater the speed of frame K' with respect to K , the greater will be the retardation of clock K' with respect to the opposite clock on K , and therefore with respect to all the synchronous clocks on K . This is the physical phenomenon that would be observed according to the theory of relativity.

In describing the foregoing experiment I have said nothing about time or its relativity. The objective physical phenomenon is that the hand of K' lags behind that of a clock on K . The theory of time is introduced when I postulate that time is to be defined in terms of the indication of a clock. It then follows that if the clock K' indicates 5 when the opposite clock on K reads 6, we must say that a process, namely, the motion of the hand of K' from 0 to 5, which requires 5 units of time relative to K' , requires 6 units of time relative to K . Thus, the measure of the duration of a physical process is relative to the frame of reference. The precise relation between the readings of the clocks is given by the Lorentz transformation, which reduces to the equation of the absolutistic theory for values of the velocity which are small with respect to the velocity of light.

The assumptions upon which the special theory of relativity is

founded are partly empirical and partly conventional. The empirical basis is expressed in assumptions about physical processes, in particular, the periodic behavior of clocks in two frames of reference. An empirical fact implied in the theory of relativity is that a moving clock lags behind a stationary clock. When the hand of clock K' coincides with 5, the hand of clock K coincides with 6. The conventional element in the theory resides in the employment of such facts for the construction of time systems. If we accept the historic method of assigning the time coordinate, in which we assume that each performance of a periodic motion requires a unit interval of time, then we are constrained to accept a relativistic theory of time. The clock K' defines a time system for K' which does not coincide with the time system which clock K defines for K . If an event occurs at time t in K it occurs at time $t' = \beta(t - \frac{vx}{c^2})$ in K' . Thus the time coordinate depends upon the frame of reference. In particular, if two separated events are simultaneous with respect to K they are not simultaneous with respect to K' .

Accordingly, if one wished to reject the theory of relativity, one might do so on one of two grounds. One might contend that periodic processes do not behave in the manner described in the theory. This is a question of fact which does not involve the theory of time. But even if one accepts the empirical facts of the theory of relativity, one might decline to accept a relativistic schema of time. One might arbitrarily select the clocks in one frame, say K , as the basis of the time coordinate. But then the readings of clocks in K' would not indicate standard time, the readings of these clocks would have to be corrected in order to express time in terms of the time system of K . Thus, in principle, one could use a single time system for all frames of reference; one could adopt an absolutistic schema of time.

Such a procedure, however, would violate traditional methodological principles. In the first place, we ought to adopt a coordinate system for time which is adapted to our instruments for measuring time. This has been the basis of definitions of time in the past, and it would accord with this principle to assign the time coordinate directly on the basis of the readings of our clocks. Hence, we should say that the hand of clock K' reaches the mark 5 in 5 units with

respect to K' , and that during this process the hand of K reaches the mark 6 in 6 units with respect to K . Accordingly, a process which takes 5 units of time with respect to K' requires 6 units of time from the standpoint of K . The adaptation of the schema of time to our clocks requires the relativistic theory. Furthermore, the use of K time in frame K' would make the equations of physics in K' different in form from those in K . But if one uses the relativistic theory, the equations have the same form in all permissible frames of reference, that is, the phenomena obey the same laws in both frames. Thus, assuming that the descriptions of the behavior of clocks are correct, persistence in the use of absolute time, while abstractly possible, would be contrary to historic methodological principles, inconvenient for measurement, and would introduce complications in the expression of physical laws.

It will be useful to supplement the foregoing account of the theory of relativity with a sketch of its origin.

Classical physics was based upon Newtonian mechanics, which presupposed an absolutistic theory of space and time. This theory was expressed in the equations which connect the space and time coordinates in one frame of reference, with the coordinates in a frame which is moving with uniform motion with respect to the first. On this foundation mechanics satisfies a principle of relativity of uniform motion: the equations of mechanics have the same form in a set of frames which are in uniform motion with respect to one another.

The electromagnetic theory of the latter part of the nineteenth century was based upon the same theory of space and time as mechanics. The electromagnetic theory, however, presupposed that electromagnetic processes have their seat in an ether which is absolutely fixed. Electromagnetic processes were described with respect to the fixed ether as the only permissible frame of reference. Thus, the principle of relativity of uniform motion was abandoned: the equations of electromagnetic theory are not invariant under the Galilean transformation. Now, one of the fundamental laws of electromagnetic theory was that the magnitude of the velocity of light is a constant which is independent of the motion of the source. This law was assumed to hold only with respect to the fixed ether. With respect to a moving frame the velocity of

light would depend upon its direction. In the direction of motion of the frame the velocity of light relative to the frame would be equal to the velocity relative to the ether minus the velocity of the frame relative to the ether. In the opposite direction the velocity relative to the frame would be the sum of the velocity relative to the ether and the velocity of the frame. Hence, by measuring the velocity of light in a moving frame one could find the velocity of the frame relative to the ether. Now, the earth in its revolution around the sun at some time certainly moves with respect to the ether. Hence, an appropriate optical experiment should enable one to detect the velocity of the earth through the ether. This was the object of the Michelson-Morley experiment, the results of which were negative.

Thus, there appeared to be a contradiction between the principle of the constancy of the velocity of light and the principle of relativity of uniform motion. The former principle was necessary for the wave theory of light, the principle of relativity appeared to be confirmed by negative experimental results. Einstein resolved the contradiction by transforming the theory of space and time. He made the principle of relativity and the principle of the constancy of the velocity of light compatible by introducing a relativistic theory of space and time. For the Galilean transformation of coordinates he substituted the Lorentz transformation. The principle of relativity is satisfied in that the equations which express physical laws are invariant under the Lorentz transformation. Thus, the ether is abandoned as a required frame of reference for electromagnetic phenomena. All frames of a specific type are equally permissible for the expression of physical laws.

The special position of the principle of the constancy of the velocity of light in the theory arises from the circumstance that a union of this principle with the principle of relativity is sufficient to describe the theory of space and time which is presupposed. The union of the two assumptions yields the result that the velocity of light is the same in all frames. If time is defined so that the velocity of light is a constant the negative result of the Michelson-Morley experiment is immediately understandable. If two beams travel the same distance in different directions the assumption of the constancy of the velocity of light means that the same time

interval is to be assigned to the duration of both processes. It thus accords with the definition of time that when the two beams are reunited the interference fringes do not exhibit any difference in phase. Thus the most direct interpretation of the principle of the constancy of the velocity of light is that it is a definition of time. Light travels equal distances in equal times by definition. It might be contended that one could in principle test the constancy of the velocity of light by means of a mechanical clock. One would measure the average to and fro velocity of light in several directions with respect to the earth. If one then obtained the same numerical results one could say that the theory of relativity is correct, presupposing the clock as a definition of time. But such a definite experiment is impractical, the disturbing influences are likely to be too great for reproducible results. Since it was an observed agreement in phase of light beams which provided the basis for the assumption, we may say that the principle of the constancy of the velocity of light is a definition of time which is employed in actual experiments. The agreement in phase of light beams is a method of test. We may, however, conceive of an ideal clock that keeps relativistic time and such a clock was assumed in order to explain the concepts of relativity in a preliminary manner. But in the theory of relativity an ideal mechanical clock is merely a hypothetical definition of time, whereas the constancy of the velocity of light provides an actual test. From this point of view the careful experiments on the velocity of light prove, not that the velocity has a specific constant value, but that the mechanical clocks that are used in the experiment keep time as defined by the principle of the constancy of the velocity of light.

The absolutistic theory of time was adapted to the representation of mechanical processes in which the velocities are small in comparison with the velocity of light. The relativistic theory is adapted to the representation of electromagnetic processes which travel with the velocity of light. In extending his theory to mechanics, Einstein adopted the hypothesis that if our observations were sufficiently refined the relativistic theory would also be better adapted to mechanics. This assumption has been verified; for example, by the verification of the increase in mass with velocity required by the theory of relativity.

The philosophical problems concerning the schema of time which have been discussed are methodological problems of the correlation of the schema with clocks. One may further ask whether more metaphysical and epistemological problems are raised by the theory of relativity. I do not think that the substitution of a relativistic for an absolutistic theory implies a fundamental philosophical change. For the theory of time in physics, the two factors are the behavior of physical mechanisms which are chosen as clocks, and the method of assigning time coordinates to specific events. The fundamental methodological principle is that the time coordinate is to be directly adapted to the clock. In classical mechanics it was assumed that the same time coordinate could be used in all frames of reference, but refined observation of electromagnetic processes has brought about the use of relativistic time. The need for relativistic time is immediately exemplified by the assumed fact that a moving clock lags behind a stationary clock. Now, that a moving clock lags behind a stationary one is an empirical fact which does not presuppose a special philosophical theory. The clock may be an independent reality which is the cause of a mental representation; or the clock may be constituted by the experiences which are said to be of the clock. Whatever the metaphysical status ascribed to the clock, it would have to be recognized by all philosophical theories that the moving clock lags behind the stationary one. The relativistic theory of time is directly adapted to describe such facts and is quite independent of any specific metaphysical or epistemological theory of the reality of clocks. In the past it has been my view that one might adopt an absolutistic theory of time on the basis of dualism, but I am now convinced that the issues between monism and dualism in the theory of knowledge have no bearing on the problem. If the physical facts have been correctly reported a dualistic theory would require that an independently real moving clock must be thought of as lagging behind an independently real stationary clock. The independently real light beams which travel along different paths in the Michelson-Morley experiment must not exhibit any independently real difference in phase when they are reunited. Thus one would be constrained to adopt the relativistic method of the assignment of the time coordinate. Of course, one has the right to insist upon an

absolutistic theory, but then the direct readings of the clocks in moving frames would all have to be corrected and the form of natural laws would be more complicated. One has the right, I suppose, to contend that two clocks going at different rates are proceeding in an absolute time system which is independent of the clocks, but there appears to be no use for such a time system in physics. If the schema of time is a structure which is based upon abstraction from physical events and processes it must be conceived to be relative.

Thus far, it has been assumed that a clock indicates the time coordinate. Since a clock which is in uniform motion lags behind a stationary clock, the schema of time adapted to the one clock differs from that adapted to the other. Now the special theory of relativity has introduced the concept of a four-dimensional continuum of events, in which two separated events are characterized by an interval which is compounded of their distance in space and separation in time. In the four-dimensional world a clock marks off intervals; in successive periods it marks off equal intervals. This holds whether the clock be at rest or in uniform motion. If the clock is at rest, successive events which consist in the coincidence of the hand of the clock with the same mark occur at the same point in space in the given frame of reference and the time between the events is directly proportional to the interval; indeed, the time may be chosen numerically equal to the interval. Thus, the clock in marking off equal intervals also marks off equal times. In the special theory of relativity a clock at rest in a frame provides a basis for a metrical schema of time in that frame. In the general theory of relativity the simple connection between the schema of time and the indication of a clock is lost. The time coordinate loses its direct metrical significance. But a discussion of this point falls outside the scope of the present paper.

V

The schema of time which has been described is a definite structure with a sharply defined nature. Although there is always some indefiniteness in the characters of phenomena, the schema of time is definite. Thus we have represented the schema as a continuous series which is defined by a set of postulates. This schema has been

adapted to macroscopic phenomena. It has been an assumption of classical physics that an exact schema would be more and more precisely applicable to physical processes as the conditions were more and more definitely controlled. In the quantum theory, however, the unlimited precision of applicability of a time schema is abandoned, under certain conditions the schema cannot even be applied. The schema itself remains definite, but its applicability to phenomena is restricted.

This limitation in the applicability of the schema of time exemplifies a general principle of complementarity. Physical quantities occur in canonically conjugated pairs; for example, coördinates of position and components of momentum are conjugate quantities. The conditions of definition for position exclude the conditions of definition for momentum. Thus, when the concept of position can be applied with precision the concept of momentum has no definite application. The positional and dynamical definition of a physical object are mutually exclusive, but complementary. The reciprocal limitation in the definition of these quantities is expressed by a principle of indeterminacy. Now, energy and time similarly are canonically conjugated quantities; sharpness of definition of energy excludes definition of time, and *vice versa*. The schema of time, which has been constructed for the representation of macroscopic processes, is thus limited in its applicability to microscopic processes by the principle of indeterminacy.

The special theory of relativity modified classical physics by substituting relative time for absolute time. The quantum theory has limited the applicability of a precise schema of time to microscopic phenomena.

I conclude this paper with a brief summary. Time is the order of succession of phenomena. A schema of time is a precise conceptual structure which is introduced into a stream of events for the purpose of representing temporal characteristics. The schema is adapted to the rhythm of natural processes; in a rough sense it is an abstraction from phenomena, but a schema possesses a definite structure which constitutes an extrapolation beyond possible experience. Thus, a schema of time is constituted by a continuous series of instants, none of which is exhibited sharply in definite events. Nevertheless, the schema is attached to phenomena by the

approximate correlation of striking natural events with fixed positions in the schema. Hence, in a properly interpreted sense a schema is an abstraction from experience.

A schema of time is a frame in an order of succession of natural phenomena. A metrical schema of time is initially defined by the periodic behavior of mechanisms called clocks. By definition, equal intervals of time are marked off by successive periods of some standard clock. In the advanced phases of development of physics, however, time comes to be defined by general laws. In particular, the first law of motion may be interpreted as a definition of time. The extension of the schema throughout space requires a law of connection between local times, this is provided by the principle of the constancy of the velocity of light. This principle accordingly is recognized as the fundamental definition of extended metrical time.

We have examined the characteristics of a schema of time. In classical physics, essentially only one schema was used, time was conceived to be absolute. Refined electromagnetic experiments, however, have impelled the adoption of a multiplicity of schemas of time. In the theory of relativity the schema becomes relative to the frame of reference. The quantum theory has introduced a more radical modification in the theory of time. Our classical physical quantities have proved to be inadequate for the representation of microscopic processes. The exact schema of time inherited from classical and relativistic physics is limited in its applicability by a principle of indeterminacy.

TIME IN OPERATIONAL ANALYSIS

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EDWARD W. STRONG

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AN ATTEMPT TO LOCATE the problem of time in its historical setting leads one to conclude that there has been no single problem of time variously approached. To cite an example, the discussion of time by Anselm in the eleventh century and by Isaac Barrow in the seventeenth turns around two quite distinct problems. If, in the face of this difference, one assumes that there is a problem of time-as-such, this assumption is itself a theory of time which, taken as a thesis, leads to the assaying of time theories on the basis of their disclosure of one or another aspect of time *per se*. Such a thesis raises the question of the status of an *as such* theory of time. Anselm on eternity and Barrow on absolute Time are concerned each with a problem to be understood in its historical setting. Although their problems are separate, I find both men employing a distinction which appears to be inseparable from the discussion of time. It is a distinction implied in Aristotle's famous definition of time as "the number of motion in respect to before and after." The number refers to that which is numbered as before and after but is not the motion by which there is before and after. In medieval terminology this is the distinction between one duration referred to another as *in* the time of that other, and the duration or process of a thing itself as *with* time. A problem of time for operational analysis lies in making clear what this usage means. A more usual philosophical procedure has been to carry on a discussion of time in terms of this distinction in the interest of some metaphysical theory in which the distinction is given an indigenous interpretation. To this procedure can be traced many of the paradoxes, antinomies, and puzzles of time. Whether this results from the distinction or from the philosopher's metaphysics remains to be seen.

Anselm's problem was the relation of eternity to time. The relation was based on an artistic or vital analogy between the Creator

and the creature created. The patterns through which the world of creatures was brought into being are sempiternal forms in God's mind. The first question raised by the analogy seems naturally to be the question of the material in which the eternal Artist expressed his plans. Is the world eternal or did it have a temporal beginning? To affirm the latter required a creation in which the Creator's Word was the sufficient cause of the world's coming to be. The eternity of the world was theologically repugnant, for it compromised God's unity and perfection in postulating a prime-matter coequal in eternity with God in its potentiality to receive and distribute the imprint of His Ideas. Without prime-matter, the divine Artist must be conceived as immutably one and yet as producing a world of multiplicity and change. Eternity is with God, whose transcendent substance and essence are not subject to the law of parts and whose immanence is not before nor after. The teleological relation from superior to inferior does not deny causal sequences of motion in the created world, but the ultimate explanation is aesthetic and not in terms of places and times.

Time is defined, by Anselm, as motion, whether of growth or of change with things, and as the measure of one duration by another. There is no time before creation, since time is only *with* things existing and is told *in* the measure of one duration by another.

For, to this law of space and time, nothing seems to be subject, except the beings which so exist in space or time that they do not transcend extent of space or duration of time . . . For it seems to be rightly said, that place is predicable only of objects whose magnitude place contains by including it, and includes by containing it, and that time is predicable only of objects whose duration time ends by measuring it, and measures by ending it.*

This argument does not require a creation theory of the world, but in terms of it a creation theory is paradoxical. For, since the world was created, God must have brought it into existence at some time or other, or never. There is no time in which God could have created the world, since time is only with creatures and these creatures are only in time relationally to one another. Time is not prior to the world, and this can be taken as a theological answer to those who try to discuss the creation of the world as an act in time rather than a creation from eternity. Yet since, on the other hand, there

* *Monologum*, Chap. XXII.

is no before and after in eternity,*there is not a first instant in which the world was created, the only first instant being an instant with a created world. The only time prior to that instant would have to be a time of that world or some other, and so on in an infinite regress. Without a creation sooner or later, God never created the world, or, God in creating the world contradicted the logic of immutable eternity for a moment of creation and in that moment located his eternities as before and after that act.

Isaac Barrow is concerned also with God's relation to nature in a lecture otherwise dealing with the problem of time as a measure of motion. On the basis that he who knows nothing of motion is ignorant of nature, Barrow tells the reader what he proposes:

... because the *Mathematicians* frequently make use of Time, they ought to have a distinct Idea of the meaning of that Word, otherwise they are Quacks. My Auditors may therefore, on this Occasion, very justly require an Answer from me, which I shall now give, and that in the plainest and least ambiguous Expressions, avoiding as much as possible all trifling and empty Words.*

Time is the continuance of a thing in its own being, and a longer and shorter time is the quantity or measure of this continuance by other bodies and motions.

. we first assume Time from some Motion, and afterwards judge thence of other Motions, which in Reality is no more than comparing some Motions with others, by the Assistance of Time.

The primary and original measures of time are

those Motions which are near us, that strike upon our Senses, and fall under our Experience, since by their Means, we discover the Regularity of the celestial Motions

As the foregoing quotations indicate, Barrow is concerned with the physical and metrical operations of measuring motion by time and time by motion. What, then, introduces absolute Space and Time into his inquiry?

The answer seems clear from the context and in view of the fact that Barrow was both scientist and theologian. Nature is to be understood in a mechanical and not a teleological description, by measure and not by classification. Everything in nature, for Barrow, "is produced by Motion, or certainly not without Motion "

* *Geometrical Lectures*, translated from the Latin edition, revised and corrected by the late Sir Isaac Newton, by Edmund Stone (London, 1735), Lecture 1

If time is the measure of motion for the mathematical investigator, and if this is always the measure of one motion by another, how shall the relation of God be conceived to a world primarily significant in spatial-temporal relations? As eternal, God cannot be motion nor the measure of motion, but it would be impious to deny that the natural world is also God's world. Barrow relates God to the world of observed motions and employed measures through the "possibility" of absolute Space and Time.

But perhaps you may ask, whether Time was not before the World was created? And if Time does not flow in the Extramundane Space, where nothing is. A mere Vacuum? I answer, that since there was a Space before the World was created, and that there now is an Extramundane, infinite Space, (where God is present,) inasmuch as there might have been of old, and now may be, such and so many Bodies, which then were not, and now are not, consequently Time existed before the World began, and does exist together with the World in the Extramundane Space. Time therefore does not imply an actual Existence, but only the Capacity or Possibility of the Continuance of Existence, just as Space expresses the Capacity of a Magnitude contain'd in it.*

It is the capacity of absolute Space and Time that enables God to contain the relational space and time of the scientist. These capacities are absolute categories which only a mind more perfect than ours may possibly comprehend. Although Barrow calls "possible" Space and Time absolute *quantums* independent of all measure, yet he adds, as a scientist, that we cannot tell what any quantity is unless we measure it. One can admire his prudence in referring to absolute Space and Time as possibilities especially since, or perhaps because, his actual procedures do not establish nor depend upon these speculative concepts. Barrow's promise to discuss time "in the plainest and least ambiguous Expressions, avoiding as much as possible all trifling and empty Words" affords a precept which an operational analysis attempts to follow.

II

By an operational or situational analysis we attempt to specify situations and procedures in which, or with respect to which, a concept is established and used. Time as a concept can be clarified, first, in respect to how the word is used in discourse; and, second, in respect to what is empirically meant by that discourse. In phys-

* *Op cit*, pp. 5-6.

ical science, time is a concept of measure and here the measuring procedures are to be consulted for the meaning of the concept. In psychology, time is connected with processes of remembering, attending, and expecting. In history, time is understood in reference to the sequence of events by dates and periods. The problems of time for physicist, psychologist, and historian are problems specific to their fields of investigation, envisaged in terms of their subject-matter, and solved in respect to the operations of timing involved. I do not see that there is a problem of time peculiar to philosophy correspondent to a problem of "acceleration," "attention," or "date of occurrence"—that is to say, a problem involving a subject-matter specific and peculiar to philosophy. Yet no explanation of natural and human affairs can be given without recourse to temporal references and expressions. In telling what time it is, we are not telling what time is although the former can be analyzed as a means to understanding the latter. The operational approach attempts to assay what time is from the "telling" and the nature of the conditions told.

It may be objected that, by this approach, we do not get at the reality of time at all but rather reduce it to something else. However, unless it first can be established that there is time as a metaphysical something-in-its-own-right, the charges of reduction carry no weight. There is a sense in which one can speak of "real time"; but in this sense, real time is nothing other than the assertion of what seems inescapable in experience, namely, that things appear, move, change, and perish—that things are in process. This process in, of, and with things is the temporal character of things, their *with* time nature. This is not because of time, but an assertion that without things in process there would be nothing to relate *in* time. All statements of *in* time, I shall hold, are statements which have their meaning established in reference to physical and metrical, psychological and historical orders of the before-and-after of things in process.* Prior to asserting in what sense, or senses

* The phrase "things in process" intends no existential separation of process and thing. To say that a tree exists is to say that it is a persistent or continuant thing. The before-and-after of discriminated stages of growth constitute a continuity of events in respect to the individual continuant. Where we deal with a field of individual continuants, the field is also a continuant which persists as long as there are members. In a field, things in process are referable to each other as being earlier, contemporaneous, or later. Before-and-after

time is conceptual-perceptual, concrete-abstract, psychological-mathematical, subjective-objective, constitutive-formal, creative-dead, relative-absolute, or specious-real, we can investigate how time is operationally defined. I believe that I can assert both members of the pairs above linked by specifying different references and usages, but it is the conditions of reference and use that make this possible and not something inhering in time as a medium, or as a metaphysical entity. Although time is significant without ambiguity in more than one context, the distinction between *in* and *with* time seems implicated in every context in which the concept is discussed. This suggests that ambiguity and confusion in connection with the concept arise from use and not from the nature of time. Physical and psychological meanings of time are correlatable, but this requires no meaning of time other than that which we treat empirically in specifiable usages and fields.

I am aware that the statement just made can be construed as a metaphysical assertion which can be taken to deny, for example, a Kantian or Bergsonian metaphysic of time. The primary business of an operational analysis is not to begin with metaphysical assertions and denials, but to locate and define the meaning of concepts in respect to their use. Its merits rest upon method, and the conclusions reached are to be modified and corrected whenever the procedure is shown to be inadequate. The recognition that no phenomenon is a phenomenon *of* time and yet that every phenomenon is *in* time led Kant to construe time as a universal aesthetic structure transcendental to phenomena. The construction assumes an epistemological doctrine of the phenomenal and the knower, and this doctrine is one possible explanation of how we know the temporal character of our world of experience. If there were any way of establishing the truth of the Kantian argument in respect to time, it would be prior to all further considerations. We cannot avoid assigning an "in time" relation to phenomena, but only on some special doctrine of phenomena are we obliged to locate the relation as an *a priori* synthetic structure of mind.

signifies a relation that does not apply to a total continuant but refers to stages within that total, or to the relation of a total to other totals in a field. A total continuant is *with* time but is not *in* time until a reference is made to other continuants in a common field. Events within a continuant are *in* the time of that continuant.

Before we say, as Bergson does, that we mix space or analysis with time, we can ask ourselves whether time is such that men can mix anything with it even though they may be mixed up in their thinking about it

In using the term "analysis" in connection with time, I feel some obligation to mention further Bergson's charge that analysis geometrizes time and is thus never able to do justice to the intuited absolute flow of process apart from all conceptual organization. While I agree to Bergson's argument that analytical elements, such as infinitesimal moments, cannot be synthesized into the flow of process, his treatment of analysis confuses method with result by supposing that since the result of analysis is in the form of discretions and discriminations, analysis can only operate on the immobile and static.

As a result of an illusion deeply rooted in our mind, and because we cannot prevent ourselves from considering analysis as the equivalent of intuition, we begin by distinguishing along the whole extent of the movement, a certain number of possible stoppages or points, which we make, whether they like it or no, parts of the movement. Faced with our impotence to reconstruct the movement with these points, we insert other points, believing that we can in this way get nearer to the essential mobility in the movement.*

So far as any philosopher has attempted to pass from stoppages to movement by way of addition, we need not appeal to a doctrine of intuition to show that addition is not movement. A clock as a "schematic thing" does not operate on the immobile. The clock's measure of motion is not a measure of its own intervals of minutes and seconds. When Bergson states that we can pass from intuition to analysis, but not from analysis to intuition, neither of the references is a description of operational analysis. We do not pass from a motion measured to a system of measurement and suppose that our intervals of measure *are* the motion measured by them. A correlation of occurrences and numbers does not make the numbers part of the occurrences. Refinements of accuracy in measurement are not an attempt to get nearer to the essential mobility in the movement. There is no reason to counterfeit movement, but we often need to discriminate rates, changes, accelerations, startings, and stoppings more accurately. A clock or other metrical

* Bergson, *An Introduction to Metaphysics*, tr. by T. E. Hulme (New York and London, 1912), p. 50.

instrument implies a field in which it is used, but it is not a substitute for the field and the use. For a believer in the inmost nature of things, the charge that rational analysis does not penetrate into this inmost nature can be used as a bolster for a different kind or way of knowing. An operational analysis has no privileged case to make for conceptual organization. If concepts have meaning, their function is found in reference to a subject-matter, not in a displacing of it.

III

To find the meaning of time, then, in respect to the distinction between "in time" and "with time," let us put our inquiry in the form of two questions: (1) Do things exist in time? (2) What is the flow of time in respect to succession, irreversibility, beginning and ending, the occurrence of events, and the use of time?

Whatever answers might be given to these questions apart from a reference to some subject-matter, our problem is to specify conditions under which the questions are answerable and to examine the conditions specified. I shall regard an expression of time as unambiguous if instruments, conditions, and method involved in the definition are such that anyone else can operate with them and arrive at a like outcome. I accept as an axiom of measurement that the measure of duration refers to the continuance-in-being, the thing in process or the persisting of the thing measured, and that the measuring system indicates an objective relation. Thus, when I say, "I have been waiting on this corner for you for ten minutes," my waiting is a duration of my body on the corner and the measure of the waiting is by a specific clock. The clock is one set of physical processes correlated as a measure with another set of processes. Generalizing, any equable or regular motion within a structure of equal intervals is a measure for any other process correlatable with it. The clock persists with the process measured and may in turn, as a physical process, be referred to another clock. The measure of the continuance of a thing presupposes its process or enduring, for otherwise there is nothing to measure.

Let us now consider what is expressed in three statements in which "in time" is predicated:

- (1) Columbus discovered America in 1492.
- (2) I wrote the foregoing paragraph in two minutes

(3) In the time of my childhood, I learned to say—

In the kingdom there is a city
In the city there is a town
In the town there is a street
In the street there is a house
In the house there is a room
In the room there is a desk
In the desk there is a drawer
In the drawer there is a key,
Key in the drawer
Drawer in the desk
Desk in the room
Room in the house
House in the street
Street in the town
Town in the city
City in the kingdom
And this is the key to the kingdom

(1) Columbus discovered land in a sailing vessel in the location described by geographers

(2) The marks of the sentences are on the paper, the paper on the desk in the room

(3) While thinking of "in," I remembered a jingle with a great many "ins."

I locate 1492 in reference to history and the calendar, two minutes on my watch, and my childhood in the recollection of previous performance. In the three references, I find that the discovery, the writing, and the performance now remembered as past are all "in time" in being in one or another chronological reference. The calendar, the clock, and the divisions of past and present are orders in which, respectively, historical events, something going on, and the sequence of earlier and later are said to be. I have never perceived a thing that was not coexisting with myself and other things, but neither I nor the other things were time. I perceive a gull flying behind the ferry boat, and in the time that it takes to cross the bay the gull follows the boat. The bird was flying in the air and the boat was moving in the water. Such examination of experience leads me to conclude that time is not a medium in which things are experienced. The time taken was taken from the intervals passed over by the pointer of a clock in motion during the passage; or I can say that as long as the boat moved, the gull followed the boat. In the latter situation, one total process is re-

ferred to as timing another. A world of processes to be timed is a temporal world and this temporal character is the persistence of things in being. Intervals of motion on clocks are correlatable with intervals astronomically determined, and *vice versa*, since both are orders of motion. No process can be measured by a given clock if the total duration of the process is less than the least interval on the clock. The ordinary timepiece is not precise enough for many physical occurrences.

The procedure of referring one physical process to another is the basis of all timing. Thus I say, "As long as the light lasts, I shall work in the garden." When any process is referred to in respect to the continuation of any other process, the persistence of the first times the persistence of the second. The calendar is based on the repetitive alternation of day and night, the year on the recurrence of seasons, and both are further explained by an astronomical account. Periodicity is the basis of a reliable scheme of measurement. Were all individuals in a community to have the sensation of hunger recurring in a common and regular interval, appointments could be made by appetite.

The jingle about the key to the kingdom locates places within places, but expresses no temporal reference. In order to introduce a temporal reference we must introduce persistence or motion, and with motion we have a history of events as before and after each other. Let us rewrite the jingle and temporalize it:

My kingdom for a horse, but I need the key to the kingdom—
 In the kingdom I go to the city
 In the city to the town
 In the town to a street
 In the street to a house
 In the house to a room
 In the room to a desk
 In the desk to a drawer
 In the drawer to a key;
 Key from the drawer
 Away from the desk
 Out of the room
 Out of the house
 Down the street
 Leave the town
 Depart from the city
 Here is the key, take the kingdom
 And give me the horse.

All those acts which took place one after another were spatially located in the kingdom, but the "one after another" is not just a series of places. We have a history of events, each event being a span of process, and these spans being linked together to form the total event or history of acquiring the key. No event as a total, nor the linking of event to event in the sequence making up the total history, is process. The process was in the going, getting, leaving, giving, and receiving. Process is described, however, as a sequence of events; history is made up of linked spans. We infer activity from the description, for the description tells us what went on in the kingdom. The distance from the king's hat to his shoes is not temporal, but putting them on is. Each event and the total history of the affair of the key in the kingdom is measurable if we take a constant motion going on in a physical structure of intervals equal to one another and correlatable with occurrences. The more uniform the motion and the more precise the intervals, the more accurate the measure.

Clock measure is no different in principle from any measure of one physical process by another in respect to duration. If I light a match and say, "I will hold my breath until this match burns out," the persistence of the burning from the lighting to the extinguishing is the time in which I hold my breath. There must be in any physical timing a *from*, *to*, and *through* or *over* or *in*. The match *in* burning *from* beginning *to* end is the length of time in which my breath was held. If all matches burned alike and were burned in a series, we would have a burning clock; and, in fact, candles have been made with sufficient uniformity and burned under conditions sufficiently controlled to enable men to use them for timing purposes. The various kinds of clocks that have been invented have not made nature more precise; but they have enabled men to discover, precisely, the regularities and recurrences in nature and to control their own comings and goings by more than the crude observations of the positions of sun and moon and the promptings of hunger and fatigue. In spite of the poets, no man has ever been killed by time, although a man might be killed with a clock. If a murderer wielding the clock observed the dial as he performed the deed, he would know to the minute when the deed was done. A man can be killed in reference to the season,

month, day, hour, minute, and second, but not literally shot in time although he might be shot in his timepiece. The latter is what happened to a sheriff whose watch stopped a bullet. The bullet also stopped the watch, so the sheriff knew exactly when his activity as sheriff was preserved by the instrument which he used to measure his activities.

Finally, the term "existence" is not predicable of existence. Existence cannot come into and go out of itself. Things that exist perish as identifiable entities in the complexes where they are known and named. A moth devoured by the flame ceases to be that which it was when it flew to the fatal light. What the moth is now is discoverable in the chemistry of gas and ash, and this is not what it was. Destruction does not have to be balanced by construction to maintain existence, but only by further production are new members forthcoming similar to those that were destroyed. Destruction, if carried to the disintegration of every living form and even of every liquid and solid into flying molecules of gas, would not be a destruction of existence, for existence is not a substance, quality, or property that can be destroyed or that can consume itself. We cannot say that existence is, or that existence ever came into or can go out of itself. Permanence and passage are terms inseparable in use, and empty if not referred to objects, orders, and meanings.

IV

Turning now to the "flow of time," our problem is (1) the procedure for establishing flow, and (2) the further conditions and operations required in establishing the meaning of succession, irreversibility, beginning and end, occurrence of events, and the use of time.

Flow is the flow of something, whether it be the flow of physical process or physiological function. Flow cannot be said to be the motion of a thing if the flowing thing is taken in isolation from conditions under which motion is describable and verifiable. For example, to say that a single body is falling through a void is meaningless, for a body is not falling unless falling from some place to another. There is no change or motion without before and after and the going from the before as the earlier to the after as

the later Is a body of water moving? We toss a chip on the water and sight across the supposed line of motion. Other factors being eliminated, approach to or recession from the line of sight is inferred as motion in reference to the displacement of point positions. Although we can infer motion without perceiving it, I have no reasonable doubt that motion is experienced. However we may infer motion from one or another point of reference, to walk on the highway or to drive over it is to feel and see motion. Walking and riding are temporal processes in reference to my own enduring or undergoing, and in a referring of continuants to each other in the field of vision.

Is this statement that motion is experienced an assumed naive realism and would time in idealist epistemology lead to a different operational problem? It was asserted that as far as operational distinctions and definitions of "in time" and "with time" were concerned our problem was methodological. No matter where the time order and time flow might be located, the questions of order and flow have to be dealt with and their empirical meanings made out. If we begin, however, with already selected data and assume that all further explanation must work from the data as prior, we may be obliged to conclude with an idealist, realist, mechanist, or intuitionist theory of time. When I say, therefore, that motion is experienced, I intend to say simply that a motionless world would not be a world in which a problem of time would ever occur. The world is a world of things in process. I do not intend any special or privileged status for motion. To witness the outcome of an epistemological preference as a basis for time theory, let us briefly review Norman Kemp Smith's theory of time founded on the doctrine of *sensa* according to idealist interpretation.*

A *sensum* is defined as that which is sensed as distinguished from sensing as an act of apprehension. A *sensum* is an event, a "slab of duration," private to each percipient and, so far as experienced, transitory. The privacy is the privacy of an eye as an instrument. The selections can be regarded as public and objective even though the sensory mechanism is not. Privacy does not mean subjectivity. Since in color matching we compare results and not eyes, an operational treatment would not need to labor the distinc-

* *Prolegomena to an Idealist Theory of Knowledge*, pp. 80-88.

tion between private and subjective, although it is important for Kemp Smith's argument to escape solipsism. In the properties of *sensa*, as defined by Kemp Smith, lie the basic presuppositions that call forth the idealist rôle of mind or consciousness to supply, in the name of space and time, the order and flow denied to *sensa*. *Sensa* as slabs of duration have no temporal character, since they are defined as qualitatively discontinuous. This is a red patch. This is this and red is red. There is no earlier and later, no simultaneity or succession in a *sensum*. A *sensum*, in short, is a particular, discrete quality having no status other than that of being given to a perceiver. Its appearance as before, with, and after some other *sensa*, its continuity as an event with other events, can only be explained, states Kemp Smith, by consciousness. The flow or passage must be accounted for, and consciousness does duty for this also. We are thus required to distinguish in the mental field between mind as the ground of a series of events strung-along within mind (mind as the order of time) and the flow of consciousness in the experience of past, present, and future (the duration block or saddleback of time—mind as the going on of time experienced as becoming past, now present, and leading into the future). Time is not the content of *sensa*, but is apprehended in terms of *sensa* *through* something else—the something else being the two-fold aspect of mind as perspective and process. It is through mind that we apprehend *sensa* in spatial and temporal settings.

The case, therefore, stands as follows. Beginning with *sensa*, themselves analytical and timeless events, the flow of process and the order of that flow must both be specified. Kemp Smith's argument that the contemplation of a *sensum* in and of itself can never supply process nor the serial distribution of events, amounts only to a further elaboration of the definition of a *sensum*. Since a *sensum* is defined as qualitatively discontinuous, it must enter into the ground of consciousness to be discriminated as before and after and with other *sensa*. Ergo, *sensa* do not produce consciousness, but occur in mind as the wider, implied, temporal perspective. Since this perspective is not our awareness of the just gone, the now occurring, and the just coming to be, the duration block as a time span immediately experienced accounts for our appre-

hension of the beginning, enduring, and ceasing to be of *sensa*. The continuity of the successive duration blocks requires a continuous medium, the temporal perspective, while the going on of process is consciousness within the duration block. A uniform and unitary nature of time seems to be implied in mind as temporal perspective. Continuity is the series of overlapping durations in mind. Flow is immediate experience within the saddleback of time where *sensa* make their entrances, are attended to, and make their exits. I am not clear whether the duration block itself flows or whether each block is a fixed span linked to the next span in a series within the temporal perspective; nor, if the latter is assumed, whether the temporal perspective itself flows with an unchanging equable motion.

A definitive position is taken upon these questions by E. B. McGilvary in his article on "Time and the Experience of Time."^{*} McGilvary locates the flow of time as the moving temporal span or duration block. This span is the experienced, specious present consisting of a series of events interrelated as some before and some after others within the total span. Since the span moves onward in respect to the passage of events from future to past through the present, the termini of the span are constantly being renewed; and the motion of the present with its ever-renewed termini is in time as such (or eternity) which is said to be "a sufficient medium for its motion." The duration block is not only the series of events experienced as present; it is also, for McGilvary, a present growing into the future and depositing events into the past, and a present which expands as a finite bud or drop of time to the limit of an individual, accentuated act of attention, to be succeeded by another individual act. Finally, successive moments overlap so that "from one moment we get to another that does not overlap it only by going through intervening moments which do overlap one another."

Under the foregoing specifications, the duration block as a vessel of events experienced as present is navigable in its voyage through the sea of time upon the following alternatives. either (1) the moving span is a total of serial events now present and is continuous with antecedent and posterior moments by motion

^{*} *Philos Rev*, XXIII·121-145.

through overlapping termini; or (2) the span expands from a least or earliest event to the total moment or last event, the earliest and last events in the total block overlapping with the actualized and potential moments which, respectively, preceded and will succeed the growing present, or (3) the span is a fixed and unique structure through which events pass in sequence, or a span which moves over a series of events, the limits of the structure being the span of events experienced as present while past and future refer to events lying in two eternities. Theories (1) and (2) are multiple span theories in which the actual present is distinguished from presents gone and to come. Under (1), the present glides *in toto* as what it is from what it was to what it will be. Under (2), the present is a growing span with terminal parts in common with its matured and past predecessor and its potential to be present successor. Theory (3) can be called the single span theory. Events pass through a single form of presentness, but are linked in a series in an eternity contemporaneous with, but also lying before and after, the moving present.

In respect to the continuity of time, the foregoing alternatives can be restated as follows. either (1) past and future events are continuous with events in the experienced present, first, through common terms or termini successively established between the span just gone and the span just coming in and, second, by a continuous motion of the present establishing a series of instants in the continuum of Time; or (2) there is a succession of spans of attention, each span being a single continuant growing through sequential events and each total growth being continuous by common termini with predecessor and successor in the continuous flow of Time; or (3) there is a series of moments or events in the continuum of Time which are past, present, and future in respect to the passage of a continuously moving unit of attention, or moving events are continuously passing through a fixed structure of attention. McGilvary, in his article, cannot be said to hold any one of these positions, since he asserts them all as if they were supplementary and not conflicting theories of what time presents to experience. A medley of viewpoints among philosophers is to be expected, but such a medley in a single account speaks of confusion and not of clarification.

Taking the duration block as a moving, unique, psychological span of attention, not only does this vessel move onward through the medium of Time, but also within its limits we perceive the movements of passenger events from the bow to the stern of the experienced present. In respect to what is experienced, the bow and stern are themselves events. Since the span is moving, the bow of the vessel is constantly being replaced and the stern constantly melting away as the passengers enter and exit on the deck of present experience, a deck defined in length by the number of passengers now on board. Future and past passengers are in their respective oceans of eternity. How does the captain of the vessel connect the past passengers with those now here and those to come? Past events are remembered as having once been present to an experience that is not the present experience. Some connection between the present but passing and the past must be provided. We now introduce the multiple span theory by supposing that the stern of the present overlaps the bow of a vanishing deck on which the passengers slid into the past. In terms of what we attend to, the event that stands as the stern of the present is the bow of the just past, and the just past as distinguished from the remote past is so distinguished by the serial order of moments related as before and after. "The empirical past is what, having been experienced, lies behind the present span of experience, the present moment." To link past experienced with present experience is to differentiate the present span *as present* from a span just now present, where a span is defined by its terminal events. This multiplicity of spans of which only the present is actual saves the continuity of the present with past and future; but the theory of overlapping is not tenable if the present is said to be a moving span. A unique span can move over a series of intervals of which it is not a member, but a span cannot intelligibly be a member of a series and a span moving over the series.

The multiple span theory under alternative (1) is found in McGilvary's discussion of what the continuity of time is experienced as being. By his geometrical illustration, a present moment represented by the line *ac* is not suddenly replaced by the succeeding moment *bd*, but is said to glide into *bd*. Not only does *ac* glide into *bd*, but *c* and *b* overlap.

The present for instance has in one sense a next moment, that will have as its posterior terminus that instant that is its predecessor's anterior terminus. But before this next moment arrives there will have been a continuous succession of moments no one of which is next each other. Thus every moment has in one sense a next moment, in another sense this next moment is not the next. There is no mystery here, there is only difference of meaning.

The difference of meaning turns on two definitions of continuity. By one definition, time is *experienced* as being the motion of a present and the overlapping of the present with past and future moments. By a second definition, time's flow is motion *mathematically analyzed* as a series of intervals between which other intervals lie *ad infinitum*. The introduction of the mathematical analysis does not remove the mystery nor save the contradiction involved in saying that a present "will have as its posterior terminus that instant that is its predecessor's anterior terminus." Let us assume that the duration block ac is a span in which we are given *at once* as present the total span with bow and stern termini. If a span is given at once, then a and c are both given, and since c is coincident with b of the span bd , either bd as a duration block is now present or ac glides into bd by a succession of instants none of which are the specious present. In the latter case, there is only one span, the span ac , and the description of its passage is given as a and c are replaced with successive instants. The succession of instants is located as a mathematical series of infinitesimals in the continuum of eternity through which the unique duration block passes, and the awareness of that succession cannot be in the span itself. With a unique span we have a continuous motion over a series of points, but no overlapping of present with past and future moments. If, however, it be held that we glide from a to c within the span of the specious present, this gliding is present only if there is another present within which this glide is experienced. C would be future for the flow of time when we are at a , but if we also hold that the span ac is present at once as a total, then c is speciously present before it is actually present in the expanding present set in the block of the fixed present.

The theory of the expanding span, of a present that grows as a finite bud or drop, escapes difficulties attendant upon the total, moving present, but has its own peculiarities. As the present moment falls into the past from the stream of time, it leaves at the

instant of its fall an instant that will be the posterior terminus of the succeeding moment now growing. This drop is a present that is not yet the present which it will become when it is the experienced durational whole or specious present. If we experience this span growing, such experience requires another span or fixed perspective within which it is presented. With the expanding present, the series of events interrelated as some before and some after others is logically puzzling, for a present growing by such events is not the order of the events contained within a present. We are thrown back upon a fixed span to contain the growing span, or the perspective of mind, or the continuum of eternity.

Without pursuing further symptoms, the basic disease is brought on by epistemological assumptions. The time theories of Kemp Smith and McGilvary employ the distinction between "with time" and "in time," but the difficulties of explanation do not arise from the distinction. Were we to assume that we experienced continuant things in our rôle as persisting experiences, the duration block would appear to be the psychological limitations of an accentuated act of attention. The separate acts of accentuated attention would follow each other as acts of attending to something going on. The "empirical" present, then, would not be defined as the experience of a span, but as the felt and measurable limits of a single act of attending. The existence and nature of such a span of attention would constitute a question of fact for psychological investigation. The span is hypostatized into a metaphysical entity when it is spoken of as a present advancing at the expense of the future. Time as such, or eternity, is involved as the medium through which the present moves onward. Events are either in the total span of the experienced present, or in the mind's cognizance of eternity. It is pertinent to note that while both Kemp Smith and McGilvary deal with temporal experience in terms of the distinction between the flow and the order of time, their explanations of time are offered for the purpose of maintaining metaphysical and epistemological positions which make the distinction subservient to their pet presuppositions. The same procedure followed by the idealist is open to anyone who objects to their assumptions and who therefore selects other data as prior and basic to the discussion of time. The same questions of "with time" and "in time" will be raised, but

will be answered through some other type of ism. By treating the duration block as a moving (or growing) present, the motion that we experience is our own activity of attending to anything. The order and flow of time are accounted for in terms of an epistemological theory, but the relevance of such a theory to methodological questions in historical, physical, and psychological subject-matters is not apparent. When it is said, therefore, that motion is experienced, methodological qualifications of content and context are required and these are not provided by epistemological speculations.

Returning to our situational analysis, let us turn to the question of succession. Although we have specified conditions under which flow is established, we have not analyzed the sequence of earlier and later occurrences. Obviously, earlier and later, predecessor and successor are not side by side with present occurring, so as to be compared with it. Equally obvious is the fact that we can remember some of the occurrences that happened yesterday and can consider an occurrence as before and after some others. The following discussion of succession will be limited to pointing out that we can discriminate earlier and later, within an occasion presented to us, in three empirical ways. Although this discrimination involves interpretation, the succession we discriminate is not therefore mentally constituted.

(1) An occasion contains or manifests signs interpretable as an occurrence subsequent to an antecedent occurrence. Example: A scar is interpreted as an event later than the wound from which the scar formed.

(2) An occasion as a field contains signs interpretable as a series of occurrences earlier and later in the field. Example: The record of tracks in the snow is interpreted as a rabbit followed by a dog. The rabbit tracks alone form a series, the forming being regarded as sequential or in succession. Where a second set of tracks is observed to overlap the first, the superimposition is interpreted as occurring after the first set. Both sequence and superimposition are signs of history in our interpretation of the presented field.

(3) A chronological sign in reference to a known system enables us to date things as earlier and later. Example: On the Five Lakes Trail in the Sierra there is a grove of aspens profusely carved with initials. Irrespective of the dates, wood growth and weathering

are interpretable as signs of earlier and later carvings. Some of the initials are dated, and the calendar system enables one to date these inscriptions successively. Since it is possible for dates to be falsely inscribed, the dates can be checked in relation to the changes of wood growth around the cuttings if we can attribute constancy to the rate of change. If the dates are reliable upon some other basis, we can use them for determining the relative changes per year in wood growth around the inscriptions.

The series of tracks in the snow and the serial order of numbers on the clock and calendar do not establish the series as a sequence of earlier and later events or succession of occurrences. All the dates on the calendar are given at once. The number fifteen is not temporally after the number one, the fifteenth imprint on the snow is not temporally after the first track when one looks at a span of imprints numbered from one to fifteen. No calendar can be read "yesterday" or "tomorrow," although yesterday and tomorrow are numbered on the calendar. The succession of day and night is understood when we say that we cannot get to the middle of the month without going through the intervening days. Similarly, it is our information about rabbit tracks that enables us to say that the rabbit could not have passed from the first to the fifteenth imprint without running out the intervening tracks. The sequential before and after of occurrences is not a mere serial order of numbered instants or periods. The order of the series is not itself the process, but is employed with reference to the process by correlation of numbers and occurrences. One may look often at a calendar, but there is no past reference in calendar numbers if they are taken out of reference to sequential occurrences.

If the foregoing appears to be an obvious point, the conclusion to be drawn from it is perhaps not so obvious, to judge from some time theory. Because measure of process is by intervals, it does not follow that the flow or process of things is a succession of intervals in such wise that a thing, in order to endure, has to occupy successive instants or moments of time. When we consult a watch at the end of each lap of a mile race, the distance and motion on the track are correlated with intervals on the watch; but the runner was not running out of one indivisible instant into the next. Nor is the runner going over the course in the assembled spe-

cious presents of the spectators. A spectator and his watch endure through the race. To discriminate a succession of *nows* in a race presupposes the enduring discriminator, a repetitive reference, and the going on of the race.

Furthermore, a chronological system whose numbers are serially related to sequential events does not establish irreversibility of things in process. To say that a process has been going on for an hour refers to motion over a span of intervals, but this motion and span are not the direction of the going on. In the going on which we have called the temporal character of things, is there anything empirically definable as irreversible? Since the definition of flow requires a discrimination of before and after of motion, the concept of irreversibility would appear to depend upon a direction in the before-after relationship which can be traveled only one way in process. The going on of things in process seems to be definable as irreversible in at least three ways.

In the simplest and fundamental form, irreversibility is established if any occurrence *a* before another occurrence *b* is never in that sequential relation after *b*. In respect to position, *a* may be to the left, then to the right, and again to the left of *b*; and we may displace and replace *a* indefinitely. Though we return again and again to the original position, the sequence of shifts is irreversible. We could never have returned to the left if we had not first moved away from it. The placings were sequential to one another as earlier and later, even though we consider all the places to be there at once. Right is not later nor earlier than left as a position, but the occupancies of left and right are a history and the history is not reversed by restoring the original position if we can say that we are at the left *again*. Only a burning candle can be extinguished. No matter how often we relight the candle, we cannot extinguish the flame that we extinguished before. Would we have irreversibility if a number of blocks went through a cycle of arrangements over and over again? Not unless there was some serial record interpretable as earlier and later process, either on the blocks or in the field where the blocks moved, or with someone directly experiencing the shifts as a record in his own history. This first type of irreversibility depends upon a succession of earlier and later. The permanence of physical configurations is such that we speak of

returning to the same place, but the enduring of a configuration does not enable us to rescind or cancel the going from a previous occupation in a returning. Our original position is not original, but later in the return to it.

As for the second form, the second law of thermodynamics can be taken as establishing a direction to process in terms of the degradation of energy involved in the performance of work. The direction from higher to lower energy content is regarded as irreversible. Since the direction of such expenditure would in endless process reduce to the lowest level, one may argue to a finite beginning of time or to an energy-restoring process in endless time. Both hypotheses suppose a course of time, one finite and the other infinite, through which work goes on; but if the time flow is the process with things according to our definition, both hypotheses suppose a time as such. Physicists have estimated by time systems in relation to the burning that is going on in the sun how long it will be before the solar energy will be spent. Where energy levels are interpretable without exception as going from an earlier, higher level to a later, lower level, the entropic direction of temporal process can be said to be irreversible.

Third, we have qualitative irreversibility of change in complex organic forms. The species persist in individual members and neither egg nor hen is first; but in complex individuals we see the succession of stages from infancy to maturity. If adults should grow back to childhood we should have reversal of a hitherto one-directional process, but not a reversibility of before and after. The growing back to childhood could only come after a growing up from childhood. Where, as in the play "Berkeley Square," a man is imagined to return to a previous century, this return is sequential to his previous performance even though he is returning to a past before his own birth. "Drifting down the flow of time" is a metaphorical way of saying that although we are aware of persisting, we are not exerting any particular choice or selection in our environment. An equivalent statement would be to say that our bodies were functioning, but not functioning for anything in particular. It is characteristic of our organic functioning that qualitative changes take place and that the later is the older and the earlier is the younger in our careers.

Things begin and end, enduring through the process which is their persistence in being—a process described as a succession of occurrences, events, occasions. Of these events in succession, we say that some are in the past. We speak of a thing going on as having begun in the past and of its ceasing to be in the future. We thus locate succession within the order of past, present, and future. This order I shall call the system of supersession, borrowing the term from Whitehead.* He employs the term for succession of before and after in process as well as for the system of past, present, and future—a usage more apt to confuse than to clarify, as I shall attempt to point out.

From our previous analysis, the beginning and ending of an occurrence is established by correlation with other occurrences. The statement that a process ceased even though this cessation could not have been recorded is operationally meaningless. For example, to speak of "before the beginning" is meaningless if it denies the existence of an occasion to record the beginning. The beginning and ending of an occurrence are always relational to other occurrences with respect to which it begins and ends. This is an "in time" reference. "With time," a thing persists only as long as it persists. This is a simple tautology stating that a thing is when it is and is not when it is not. This self-persisting of a thing, however, is the recognition that, although its beginning and ending can only be established in reference to something other than itself, the process from beginning as that thing to the end of its enduring as that thing is only with the thing itself. Since flow or process is describable by reference to a succession of occurrences as before and after, the question of beginning and ending could never have been asked unless the questioner were not only enduring but also able to refer to process and to witness as well as undergo. In other words, only a history-possessing individual can speak of his own birth and death. Man, as a historian, dates not only the earliest appearance of written history, but also his own emergence in the animal kingdom as a distinct species, and the existence of organisms that perished before he emerged. We cannot say of non-history-possessing things that they live only in the present. If they are only their persistence in being, this persist-

* "Time," *Proc Sixth Internat. Cong. Philos.* (1926), pp. 59-64

ence interprets nothing as prior and discerns no present. Where that which came before is irrecoverable later on, there is no recognition of later on. If a man were nothing but present functioning, this functioning would not be discriminatable as present. Neither at our beginning nor at our ending are we historians, for history is of beginnings and endings and not in them. If I can say that my death will occur in some future time, it will be the time of some other being who can view my ending without perishing in my perishing.

What does it mean, then, to say that we can only exist in the present? We sometimes affirm the question as its answer: the only processes of living are the processes now occurring. But the meaning of "now" and "occurring" involve the order of supersession in which we distinguish "now" from "then," "occurring" from "has occurred." Hence *with* time I live only when I live, but *in* time the process of living is given its temporal reference, first, through a recognition of the sequence of earlier and later and, second, in locating the sequence in the system of supersession in which the present is located as present. To say that the present lives only in us means that only for existing, history-possessing individuals are past, present, and future renderable distinctions. These distinctions are not conventional nor merely psychological, for they are based on succession.

According to Whitehead, no concrete entity can change, but can only be superseded because supersession is part of its real essence. An occasion is said to be an occasion with supersession. That is to say, I take it, than an occasion leads to the future and in so doing turns its present into a past. By such usage, supersession is both the system of past, present, future, transcendent to the occasions it relates, and a three-way process in an occasion in order that it shall be able to supersede a present and have a past, or, as an occasion, that it be an occasion from past in present to future. Such usage, taken as it stands, can hardly help proving a source of profound confusion. Future, present, and past are not processes nor ways of process. From a presented occasion we can infer succession. Thus, we inferred that a dog followed a rabbit, but not that a dog was pursuing a rabbit from past into future, or pursuing through a present becoming past and leading into the future.

Succession or sequence of before and after implies three conditions, as we previously noted: from, to, and through or over or in. To supply the further specification: from past, through or over or in present to future, or, from future through or over or in present to past; or, through or over or in present from past to future—is to conjoin succession with the system of supersession and to raise problems that do not arise from succession alone. How many of the paradoxes and ambiguities connected with time result from this identification? The question suggests a line of inquiry which I can only indicate here. I do not see, for example, how a dog can possibly run from the past into the future nor from the future into the past; but I seem to have no difficulty with the sequences of earlier and later in his running. The system of supersession is asserted when I say that the chase is past history. The problem of whether the flow of time is a moving present or a time flowing through a present results from identifying temporal process with the system of supersession and then attributing process to the system. The "present" in the system of supersession is not functioning to render itself into a past, nor continually moving. To assume either alternative is to turn the system into an activity. Succession is transcended by supersession; but this transcendence, in principle, is analogous to the transcendence of a clock to the process measured by it or of a history to the events it relates.

Upon the basis of a distinction between succession and supersession, I find it possible to think of things in process as earlier and later and of this sequential performance as establishing signs of what went on. These records must be presented to a history-possessing individual in order to be read as earlier and later stages of a process; and when so read from their presentation, the reading is of the past in the present. Since the historian finds the beginning as any selected starting point for interpreting what has gone before and what comes after, the system of supersession is employed in locating the sequences in the affairs of men and nations, and we are asked by the historian to occupy past occasions as present-ed between precedent and subsequent courses of events. Events in the history are unchanging in the sense that what one event was before it was followed by another is what that event is

in the past tense That I was a child can never cease to be true, but that I am a child can never again be true On the basis of historical events, no change can go on in the events of my childhood That is to say that my beginning cannot go on beginning, nor ever begin again, for an event is *in* time but not *with* time The qualitative differences in an individual from youth to old age are signs of the functioning that brings about these differences The stages of growth in an organism can be referred to as events superseding each other, but the thing in process does not supersede itself. The thing in process is not an addition of events but its history is told as a sequence of events

By one usage, "event" stands for a span of process, as when we speak of a walk as an event Since smaller spans within the total walk are specifiable, we have events within events, and the total event can now be called a history made up of the linked spans within it An event does not change and is called ancient, medieval, or modern as a historian's division within the system of supersession In another usage, an event is any salient feature selected and related in a history with other salient features In both usages, an event is analytically discriminated as a span of happening An event as a span of happening is *in* time as earlier, contemporaneous, or later, as past, present, or future; but its temporal place is referential to and derivative from *with* time things in process. The term "point-event" is a limit approached by taking ever-shorter spans; but if the limit is reached, there is no process to span, no event by definition. A single event is not history unless linked to other events or analyzed into subevents. Events as spans of happening do not occur with the happenings they span. A man is a thing, not an event, engaged in the process of walking down the street; but the walking down the street is an event for that man's history, the history of the observers, and the history of the street and town if some historian should select this particular man and his walk as significant for his chronicle

History, then, is a record by events of the things that occurred. Events are *in* time and are to be distinguished from things in process *with* time. A man's persistence in being may be an event for an indefinite number of selections for an indefinite number of historians The significance of the man in being is expressed as

occurrences are related, is presented in the relation of events. There is no final history of a year or of a century for any but an omnipotent historian. The history of Herodotus is itself an historical event. A world in which histories are written, histories of events in the system of supersession, is a world in which things are in process contemporaneously and successively. In saying that the past grows, we are asserting that further history can be written as things occurring are selectable as events. There is no history of what is to be, simply because processes are not selectable as events until they occur and leave signs and records of their occurrence.

In the foregoing account the meaning of "event" is limited to a happening for human selection and interpretation. No thing in process is recoverable as an event after it has ended unless some physical or psychological record is available.

Imperial Caesar, dead, and turned to clay,
Might stop a hole to keep the wind away

But Caesar as an event stops no hole to the wind and the clay that might do so is not Imperial Caesar. Many men now intricately functioning will leave no signs of their duration for later generations, no record that will long outlive their careers. Perhaps one basic impulse to artistic production is the desire to preserve and transmit treasured experience otherwise lost with the experienter. Men have found consolation in the face of their transiency in believing in a great book, in which the fall of even the smallest sparrow is not unrecorded as an event. Such a book would be a complete, absolute, and monistic history in which every act was an event once and for all inscribed.

The use of time is not a problem of how to use clocks, but rather of how to dispose our activities. To this end clocks and calendars are aids. To spend too little time in any enterprise refers to what we do with our lives and not to what we do with calendars. If some men are older at thirty than other men are at forty, we understand this as a distinction between physical well-being and birth dates. Those who steal a march on time march with some purpose when they might have been resting. It is the selection, amount, and quality of activities that lead us to speak of conserving or wasting time, burning the candle at both ends, and engaging in unseason-

able enterprises Language is replete with phrases and proverbs expressing the persisting and changing, the lasting and the transition of things To this stock two more might be added. Sunday never comes around for a tree; A log does not burn on the spur of the moment

The future and past for our use of time are problematic in respect to activities of purpose and selection Although choices are made from presented evidence and inferences based on that evidence, the evidence never raises the question of whether the present moves past events or whether the events are moving past a present I can see no problem of how a world is temporal in a world where we can count our pulses, number the succession of days and nights, observe the phases of the moon and the positions of the sun above the horizon One cannot count his pulse and the succession of days and escape an obvious observation, an observation which poets have turned into prophecy and which philosophers have not so much accepted as they have sought to interpret in other terms For what is counted in the wrist is the surge of one's life blood. The pulse of that flow is the vital clock whose repetitive beat is our continuance in being, whose cessation is our own A sick man feeling for his heartbeat and wondering about tomorrow tells the most poignant kind of time, for he has transcended process in the system of supersession, he has named the tomorrow that he may never see unless each beat of the vital clock is followed by another in unbroken sequence In that sequence, as he well knows, some later beat will be the last. Most men have been unwilling to accept the testimony of their hearts as their persistence in being It seems incredible that the counter of the beats should perish with the beats he counts

It is surely not hard to understand why our transcendence to process in binding it is dreamed of as a transcendence of eternity with God in Whom there is no before and after Nor is it hard to understand the Platonic treasuring of the eternal as more real than things in process, the Forms remaining while the incomplete travels from its beginning to its end revealing order in change but never being that which it discloses. Yet if I am to take time seriously, I cannot honestly suppose that the process-transcending history saves the historian as more than an event in a history for

other historians The operator of the analysis is other than the analysis, but the nature of his process *with* time and *in* time are told in it. In this vein, I let Robert Herrick have the last word.

Come, let us go, while we are in our prime,
 And take the harmless folly of the time.
 We shall grow old apace, and die
 Before we know our liberty
 Our life is short, and our days run
 As fast away as does the sun;
 And, as a vapor or a drop of rain,
 Once lost, can ne'er be found again!
 So when or you or I are made
 A riddle, song, or fleeting shade
 All love, all liking, all delight
 Lies drowned with us in endless night
 Then while time serves, and we are but decaying
 Come, my Corinna, come, let's go a-Maying.

TIME AS DATUM AND AS CONSTRUCTION

WITH SOME CONSIDERATION OF
PHILOSOPHICAL METHOD

BY

W. R. DENNES

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W R DENNES

ONCE UPON A TIME (and indeed as lately as Professor Eddington's Gifford Lectures¹), there was much discussion of such questions as What is time really? or What is real time? as there was in similar terms of the "real natures" of substance, causation, mind, value, truth, and the like. As we all know, some of that discussion claimed to justify the conclusion that time is nothing real.

Today, I suppose the following facts and principles are admitted by all who have considered them. The first is the principle that the meaning of such a question as Is time real? depends upon what is understood by the terms "time" and "real" and "is." The second is the historical fact that the term "real" has usually been taken to designate (1) whatever is, or ever was, existent; or (2) whatever is possible (which, of course, includes whatever is existent); or else (3) some limited area of the possible or of the existent which may be of special interest to a thinker (as, for example, a particular type of "coherent" structure interested Plato, and a somewhat different type, Bosanquet). It is of the greatest importance to recognize in connection with this subject that, in spite of voluminous statements to the contrary, no philosopher has distinguished, or can distinguish, the coherent as such from the possible as such, or logically coherent existence from mere existence. On this point there seems to be no answer to Spinoza. This fact, we may remark in passing, was again brought home to us in Berkeley when Professor Cunningham* invited us to distinguish between systemic sets or wholes, on the one hand, and mere

* In the Howison Lecture for 1934, "Perspective and Context in the Meaning-Situation," *Univ. Calif. Publ. Philos.*, XVI. 29-52.

aggregates of elements on the other, by describing the systemic as sets which allowed inference to pass from part to part. Now, if we mean by inference a transaction based on a relation of necessary formal implication, then no set of elements is in Professor Cunningham's terms systemic, except a set the constituents of which repeat one another in whole or in part. But if we mean by inference the tracing, and the supposing, of existential relations, then there is no conceivable set of elements of which we can say that it is not, as such, systemic, as Professor Cunningham defined systemic. For whereas there is never a purely formal inferribility of any constituent from any other that is in all respects genuinely other than it, so also there are no distinct elements in *any* sort of aggregate, of which we can say that they could not be causally or otherwise factually related.

The third principle, bearing on all questions relating to the reality of anything, is the principle that, where the term "real" is employed in any one of the three senses named above and listed as (1), (2), and (3), such a question as *Is time, or anything else, real?* requires the following analysis. If what is referred to under the name "time" is not something possible, then nothing is referred to, though interesting sounds, gestures, and emotions may be occurring, and the assertion, as by Bradley and McTaggart, of the discovery that relational time is not real, in the sense of possible, could only be the assertion of the discovery that nothing is impossible, or, in other words, that the impossible is impossible. Such truistic conclusions could only be reached if from the start one had meant nothing by "time." State this matter positively, and you have an exceedingly important principle of philosophic method (and maxim of philosophic modesty), namely: If anyone does mean anything whatever by "time" or by any other term, then it is quite certain that no logical or dialectical analysis could ever legitimately claim to show him that what he means is contradictory, impossible, and therefore nothing real. Blindness to this principle vitiates almost all of Bradley's critique of time, as it does most of the rest of his dialectical exposure of "appearance." Recognition of the principle involves emphasis on the positive and constructive uses of analysis—as the cooperative enterprise of making clear what we do mean by our conceptions.

Now, if by the term "time" one means not only something, but something existent, or a character of something existent, then the question whether time is real must be answered affirmatively in the second sense of "real," that is, possible. The answers to the further questions, namely, whether such time is real in the first or third senses—that is, as actually existent, and as exhibiting, or as subsumable under, or as organizable within, a particular sort of "coherent" pattern—the answers to these two questions can be determined partly by philosophical analysis, but the answers must in part be determined by observation. In particular the question, whether what is meant by "time" does actually exist, or is a character or relation of actual existents, can be answered affirmatively only on the ground that what has been specified as time has been experienced as occurring, or as a character or relation of occurments. As for negative answers, the question admits two sorts. We could say it is false that temporality is a character of all existents if we experienced some existents devoid of temporal character. We could say we knew that no existents have temporal character (that is, that time is without qualification not real, in the sense of existent, or in the sense of a character of existents) only if we were omniscient—if, that is, we were acquainted with all existents as lacking temporal quality and relation. Philosophers who give this second sort of negative answer to the question have either employed an impossible notion of time—that is, a form of words each of which may have meaning, but the combination of which, though it may have valuable historical and emotional associations, can mean nothing, provided the reference of its constituent terms is maintained as defined by the philosophers themselves (a Socrates would diagnose their predicament, for example, Bradley's, as a wind-egg and not an actual pregnancy)—or they have meant that time is not real, because by "the real" they have meant *some specific type* of coherent structure, and what they mean by time does not exhibit that structure. They could not, of course, mean that what they, or any other persons, refer to as time is strictly incoherent, since nothing is, could be, or could be conceived to be, that. If they mean anything by "time," they must mean something coherent. In this sense, the answer to the question Is time real? is determined by the definitions of "time" and "real," provided the sort of

entity or character that is meant by the term "time" is either identical with, inclusive of or included in, or "contradictory of," the sort of entity or character meant by the term "real." But if what "time" is taken to mean is not the same as, nor yet included in or inclusive of, nor yet "contradictory of," what "real" is taken to mean—then, on this subject, philosophical analysis cannot go one step farther than to say that time may or may not be real. But what does that statement mean? It cannot mean that what is called "time" may or may not enter into, or be subsumed under, what is meant by "real." Those points are settled once for all in any given discussion by the definitions of "time" and "reality" employed in that discussion. It can only mean that in fact aspects of the order of events, called temporal, may or may not follow, precede, or accompany segments of the range of entities called real. And whether or not they do cannot be determined by any theory, but only by observation.

The result is that, if anyone chooses to reject the advice and the criticism of Spinoza, and to use the term "real" to mean some one particular order or structure from among all possible orders, such a man can have no choice but to answer all such questions as Is time, or anything else, real? in one of two ways. Either (1) he will have to answer them simply and directly by definition—that is, he will say arbitrarily that he does or does not mean by "time" (or any other term) some part or some character of what he means by "real", or (2) (if he defines time and reality as neither mutually implicative nor mutually exclusive) he may add to the statement of his definitions, a statement that some factual relation of precedence, succession, or concomitance holds, or fails to hold, between instances of the two, such as would justify him in calling time real or unreal, as the case might be. It has been found, as I shall indicate in two instances later on, that the relation of metaphysical presupposition, which some writers have described as holding between "the temporal" and "the real," is either such a relation of factual precedence, succession, or concomitance as has been mentioned, or else a relation of definitional inclusion.

In the situation we were last considering (the situation in which the definitions of "time" and "real" are neither mutually implicative nor yet such as to make time and reality mutually exclusive),

an hypothesis concerning time's reality might seem to be subject to verification, but only if one has taken the real initially to be one particular area or quality or pattern of being, and has chosen to call unreal all other areas or qualities or patterns of being, yet at the same time has agreed to call real any and all of those unreal parts that stand in any (or in some special) relation to the real. But thus, like Bradley, one ends in contradiction, and one's employment of the adjective "real," although it may at the start have indicated some important interest or preference or classificatory intention, finally indicates nothing. It is exactly as if Bradley's dog, that turned metaphysician and summed up all ontology in the pseudo-propositions, which we may number in terms of what we may suppose to be the best convention of modern canine logicians: "Bark Scratch. What smells is real, what does not smell is nothing", and "Bark Scratch Scratch. What you cannot smell you cannot paw at either",—it is exactly as if that canine metaphysician should have canceled the whole expression of his insight (as, *mutatis mutandis*, Bradley did his) by adding the elucidation: "Bark Bark. Although only what smells smells, nevertheless, whatever is in any way related to what smells, is also real."

Such dialectical analysis as we have followed seems to many a thin, hollow, even a quibbling method of philosophical criticism. Certainly, wherever it is not needed, it is the most superfluous commodity imaginable; and once it has accomplished its corrective purpose, it is seen (as by Plato in the *Theætetus*) to have by itself no intrinsic significance. For by itself it constitutes neither knowledge nor probable belief, and to try to sustain one's intellectual life upon it would be not merely to starve, but to starve with a bitter taste in one's mouth. If, however, philosophy is considered as distinct from poetry on the one hand, and distinct from knowledge and hypothesis with respect to factual correlations on the other (to extend which knowledge and hypothesis none but the *Fachmann* is today very well equipped), what else has philosophy been but such analysis?

Such analysis was Socrates' method with the Sophists, and was that described by Plato in the *Theætetus* as the method of philosophy; as it was Spinoza's method with the medieval and early modern teleologists, libertarians, theists, and those who said that the

necessary laws of nature were something other and more than the facts of nature; as it was Berkeley's method with the materialist school of transcendentalists, and Kant's with the various sorts of ontological argument basic to the metaphysics of many of the medi-vals, of Descartes, of Leibniz, and even of Spinoza (except that the last of these—not always, unfortunately, but in what seem to me his moments of clearest insight—saw that every sort of ontological argument is truistic, has only the negative significance of a warning not to limit reality to this sort of thing or that, and indicates nothing whatever positively as to what the world is) And, as the method is by no means new in philosophy, it is also no new thing that its exercise should prove distasteful to the unphilosophic. But, whether or not distasteful, the method is still needed in an age in which gifted writers contrast (as does Eddington, in his account of time) real worlds with knowable ones, and necessitating or controlling natural laws with merely descriptive and probable ones. It is still needed in an age when writers offer us (as does Whitehead) a metaphysics which will make it certain that there will be a future and that there was a past—neither at present experienceable, or tell us (as does Whitehead) that there could be no actual temporal occurrence were it not for God's primordial and consequent natures Does not this last statement, which purports to be part of a metaphysic of process, turn out, on analysis in its author's terms, to mean two things (1) nothing would occur unless everything were possible, and (2) nothing would occur unless something did occur? Now (2) is a plain tautology: $p > p$, or $\neg p > \neg p$ And analysis of (1) shows that, since everything is possible by Whitehead's own usage of "possibility," (1) is a statement of the form since p is true, it is false that q is true and p is false $p > \neg(q-p)$. Since it is true that everything is possible, it cannot be that anything occurs, yet that it is false that everything is possible

To sum up. If we say that time is real in the sense of possible, we say only that we mean something by "time", and if we deny that time is real (in the same sense), we say only that we mean nothing by "time" If we take "real" to mean "existent, or an order or character of existents," then whatever we may mean by "time" may or may not be such an existent, or character of exist-

ents. But if existence is defined as temporal, then no question can be raised concerning whether time is a character of the existent (although of course the *definition* cannot itself determine that there *are* any temporal existents) If existence is not so defined, then the question, whether time is or is not real in an existential sense, can be determined by no analysis, philosophical or other. It can be determined only by observation. None but an omniscient observer could determine that temporality is a character of every existent, or of none. And if that observer's processes of observation might themselves be temporal, then he would have to scrutinize all those, as well as all other occurrences, in order to know that temporality is a character of every existent, or of none. Such scrutiny is, of course, logically impossible. Finally, if (with Plato and at times Bosanquet) we mean by "real" the character of exhibiting some specific order, or pattern, then concerning time, or concerning anything else, the problem, whether it is by its nature included in this pattern, is settled by definition; whereas the problem, whether (and in what way) existent instances of time-character are related to existent instances or parts of reality, can be settled only by observation. Those who, like Bradley, have claimed to show that time is unreal have either (1) discussed nothing or (2) reported, not "proved," that what they mean by time is not exhibited in certain examined areas of existence;* or else (3) they have defined time as a possible order, but as an order different from that which they mean by "real," and have then concluded that time is unreal not only in their sense (by definition), but also unreal in the sense of "nonexistent" and even in the sense of "impossible."

For myself, I shall invite you to consider time as something very like what Aristotle seems to have meant by the Greek correlates of our term. As Mr. Strong pointed out, Aristotle everywhere avoids considering time as any sort of empty frame or empty stream into which determinate processes may intrude themselves. But beyond this, in his *Physics*, *De caelo*, and *First Philosophy*, Aristotle seems variously to consider time as (1) actually the concrete processes

* Short of "omniscience," no such report could pretend to apply to all areas of existence. Very commonly the procedure numbered (2) has (by a double *non sequitur*) been regarded as yielding the conclusion that time is not real even in the sense of possible

of motion and change in nature; (2) and most characteristically, as the measure (conveniently by relation to locomotive processes) of motion, growth, and alteration; and (3) as that particular one of the aspects of concrete motions and changes that is so measured

There is important insight in each of these meanings of time. Although I agree with most of the recent students of the subject in holding that it is best to consider time as (1) the quality of process, ongoing, as distinguished by a "distinction of reason" from the essences or objects that are also ingredients of all concrete processes, and (2) as correlations or measures of such ongoing; nevertheless I think we need the Aristotelian reminder that such qualities and measures are not capable of existence or expression by themselves. They are aspects, features, correlations, of the concrete substantial processes (or process) of motion and qualitative alteration, as which we know the world. If we always remember this, we shall for example avoid the confusion of saying that time is nothing but a dimensional order of before and after (from which order process or on-going has been eliminated), and then trying to find the temporal as passage in the before-after series. Of course, if passage is fundamental to what we understand as temporal, we can never by any feat of dialectic find it where by definition it is excluded. It is best, nevertheless, to take time as adjectival and as metrical relation; for if we took time as substantial we should have to consider time as identical *simpliciter* with existence, or nature. That is, if we mean by time thoroughly concrete process, we cannot exclude from our meaning any existent whatever. Now there is no time, as I am considering time, out of existence or nature; and there is no law or logic that forbids our defining "time" as all nature, or "the world." But in all but one very special sense it is impossible to say anything about the world *uberhaupt*, or about time *uberhaupt* taken as the whole of concrete history.

I wish, therefore, to consider time as that experienced ongoing of process which is measured by correlations between experienced processes. But is this what time really is? If that question means, Is what I propose to consider as time something real? then the answer is, Yes; real in the sense of possible (which is, of course, a redundant adjective of all significant substantives), and real also

in the sense of "manifested in experienced existents and significantly referred to in statements about nonexperienced but experienceable stretches of existence" But although what I mean by time is thus something real, is it really time? This question, in spite of its widespread rhetorical use, is, as both Mr Lenzen and Mr. Strong explained, theoretically senseless. Though it seems only fair to suppose that people who have used such language have thereby expressed emotional and practical attitudes, nevertheless, considered as ontological, this question breaks down. As Mr. Lenzen indicated, it could be significant only by reference to another definition of time, a definition which would then be subject (quite as much as the first was) to the same question, and so on *ad infinitum*

Omitting analysis of the practical and emotional attitudes reflected in statements about "real time," and omitting also the historical and pragmatic defense of the notion of time which I have adopted (as that in terms of which and with reference to which, historical and scientific statements and artistic expression seem actually to be carried on), I proceed to two other tasks, which are, I hope, more profitable. First, the fuller description of the temporal as I intend it—especially concerning its "one-dimensionality" and its "irreversibility." Second, the examination of three questions, commonly regarded as embarrassing, if not fatal, to an empiricist theory of time: (1) In what respects is time given and in what respects is it a theoretical construction? (2) What is the meaning of the statements referring to unexperienced past and future? (3) In what sense may we say that there are many temporal orders?

Following one part of Aristotle's procedure, I have described time as the ongoing of motions and of qualitative passages, generations, and alterations—an ongoing, stretches of which are measured by their relations to other stretches. Such measurement of the relations of events and of the internal surge of process is carried on in terms of dimensions, three of which we call spatial, and one of which we call temporal. These dimensions (the spatial as well as the temporal) are nothing ontologically distinct from observed and supposed events. For a first approximation we may say that they are simply ways in which events exhibit, and are ex-

pected to exhibit, the relation of succession. That relation is not completely definable in discourse. But we may refer to the customary description of it as the relation such that, if A, B, C, D, E are events, and if B succeeds A and C succeeds B, then, in the dimension determined by the relation: (1) there is no transition from A to C or from C to A except through B; (2) if a fourth event D succeeds C, then transition from A to D is through B and C successively, and not through C and B successively, and so on. It is important to notice that *any* dimension whatever of events determined by succession, and not merely the dimension called temporal, has these characteristics—the dimensions exhibited by events to the right or to the left of one another, by those above and below one another; by those in either section of the dimension “at right angles to” the plane determined by “above and below” and “right and left,” and divided into two sections by that plane; as well as the dimension exhibited in such events as we say are before and after one another. As a particular dimension of succession, the temporal shares with all other single dimensions of succession the characteristic that, if C succeeds B, and B, A, then transition from A to C, or from C to A, can occur only through B.

It is either a fact, or else a matter of definition (and not, as S. Alexander supposed, a demonstrable metaphysical principle) that, for creatures who move about as we men do, experienceable events can be “located” in these four dimensions of succession, and cannot be unambiguously “located” in any fewer dimensions. Now the order of events specified in these dimensions conjointly is such that transition from any event to any other is possible either through any specifiable third event, or not through that third event. Such theoretical “freedom” to pass through or not to pass through an intermediate event is, however, impossible within *any one* of the four dimensions of succession considered by itself. The temporal is therefore not distinguishable in this respect from the dimensions called spatial. Is it distinguishable by what is called “irreversibility”?

In considering temporal irreversibility, it is necessary to distinguish carefully what is meant by the repetition of events from what is meant by the reversal of events. It is a fact that some sorts of processes are known to be exhibited in repeated instances, and

that other sorts of processes are not known² to be so repeated. But every sort of process whatever is *entirely capable* of repeated instances. *There is nothing except the whole world-history of which we could say significantly that there could not be a second instance* But to recognize or to suppose a repetition is to deal with two instances of a type of process, which instances are temporally distinguished. Repetition, that is to say, cannot be merely spatial, not only because all events have temporal surge, but because, even in abstraction, no merely spatial complex can be made out as a repetition. It can only be a single complex until its various similar parts are taken, dealt with, experienced, lived-through, in temporal succession. This means that any event, called the repetition of another, cannot be that other identically over again, or over again in all its relations. If the repeat were *quite* identical with its prototype, there could be no sense in speaking of repetition. By definition, a repeating event E_2 cannot precede itself in any history, as the repeated event E_1 preceded E_2 in that history. A man might beget a second child—or indeed a third, a fourth, or an *n*th—with structure and character in no way different from those of his first. But no matter what he might do, he could never have another first-born.

Now what is commonly called the reversal of a process is something quite different from repetition. In seesawing, the second swoop up repeats the first, but the swoop down is roughly said to reverse it. The water in a vessel may freeze repeatedly; but the reversal of freezing is thawing. These reverse processes are not mere repetitions of instantaneous stages in an opposite sense; they are opposite passages, opposite qualitative alterations, and the like. Now, it is a fact that instances of such so-called reversal are known; but it is important to notice in these instances that it is not the original process that does the reversing, or that becomes the reversal. No process can occur in two senses, direct and reverse, for a process is not a substratum (like an unobservable ether) that could be said to bear occurrences—it is an occurrence *simpliciter*. Hence, to say that one process could be another (which is what men try to say when they speak of a process as itself suffering reversal) is impossible. But this does not mean that any conceivable event ever actually intended by those who speak of

reversals, is impossible.⁶ The reversal of entropic processes, for example, is entirely possible. Some physicists say that there are known instances of such reversal, and that we can therefore significantly judge the probability of further instances of it. But whether or not these physicists are right, entropic processes remain entirely reversible in any sense in which any process whatever could be called reversible.

Again, rejuvenation is entirely possible, either as repetition or as reversal, provided we avoid the contradictory pseudo-conceptions of repetition and reversal exposed in the preceding paragraphs. It is not impossible that an elderly Socrates should grow young and beautiful in fact, as well as in the imagination of a Plato. He *could* quite well "suddenly" repeat his youth, or he *could* "grow younger," or he *could* (what he would probably have preferred) enjoy again youthful energy and freshness along with the wisdom that experience had brought him. It is, nevertheless, impossible that a specific process of physiological senescence should *itself* also be a process of growing young. But we must here remind ourselves that no event or set of events whatever can exclude *any other* event as impossible. No event excludes the occurrence of a genuinely other event having an opposite sense and character. It excludes, and it can exclude, only its own nonoccurrence. Senescence does not make subsequent rejuvenation impossible. It merely is not itself that process. No event is, or could be, or could itself become anything but itself. No event could be reversed, or annulled, or altered in any respect, although there is absolutely no limitation which we can lay down concerning what *other* events may precede, follow, or accompany it.

This principle is overlooked by those who argue that temporal process is irreversible since, to unwind the rolled-up ball of events, an experient would have to travel back to the past with a velocity greater than that of light; that we do not know how to set out on a journey at such speed; that some causal laws make it probable (although of course not certain) that what is called matter, if it moved with such velocity relative to other matter, would no longer function in such a way as to fall under the definition of matter, or indeed to be anything that anyone has ever given evidence of having conceived. There is usually much confusion, as well as much

instruction, in such sayings. But they have no relevance to our problem since, as we have seen, the notion of an event itself identically reoccurring (no matter for what sort of traveler) is self-contradictory, as is also the notion of a process itself reversing.

Hence, no one can answer in the negative such a question as, Can a second season of youth follow a first in any personal history? Where that question is alleged to admit of a negative answer, its terms have been so construed as to make it meaningless (that is, no question), and therefore quite as unanswerable in a negative as in an affirmative sense. If reversal and repetition are understood as indicated in the preceding paragraphs, the answer to the question, as to all other questions whether anything conceivable can happen, is clearly, Yes.

Besides being possible, such exceptional repetitions and reversals as are called rejuvenation are occasionally reported as actually occurring—as by George Herbert, in the lines .

Who would have thought my shrivelled heart
Could have recovered greenness? It was gone
Quite underground . as flowers depart
To see their mother root, when they have blown,
 Where they together,
 All the hard weather,
Dead to the world, keep house unknown

These are thy wonders, Lord of Power,
Killing and quickening, bringing down to hell
And up to heaven in an hour;
Making a chiming of a passing bell
 We said amiss
 This or that is:
Thy word is all, if we could spell. . .

And now in age I bud again;
After so many deaths I live and write;
I once more smell the dew and rain
And relish versing, O my only Light!
 It cannot be
 That I am he
On whom thy tempests fell all night.

But yes, good George Herbert, it *can* be that you are he; and more than that, it is the fact, if you do (as you say) “bud again” and once more “relish versing.” There is nothing impossible about

such a history, although most of us are unable to find examples of the sort in our own lives.

Just what is it then, in terms of our analysis, that the lyric poets, from the early Chinese, and the Greeks of the Islands and Asia Minor, down to our own contemporaries—and not only the lyric poets, but most men of sentiment—what is it that they have longed for when they have complained, as Shakespeare did, that

Ruin hath taught me thus to raminate—
That time will come and take my love away?

What they have longed for is nothing impossible—such as a *known and recognized* unraveling of the total tapestry of events. No, the poets have needed, less than have the professed philosophers, Spinoza's reminder that we cannot desire what is impossible because we cannot mean anything by that. Rather, I judge they have longed for, and would be satisfied by, a continuance and development, or even a repetition, of the lives or the experiences they have loved. Our lot is, in this respect, pathetic, *not* because youth, or our "friends hid in death's dateless night" *cannot* come back to us, but simply because they do not in fact come back to us. If they did return we should (most of us) not be so foolish as to despise or reject them because what we wanted was not simply more of a particular good, but that more coming in such an impossible fashion as should not only annul the glory that had passed, but also all that had intervened between the barest beginning of our first delight in it and our present enjoyment. The poets, and other sane men, have not desired events that should follow, and yet not follow, others similar that were precious to them. Nor have they desired a cessation of all process as a means of making what they love secure. For such cessation would include the cessation of their knowing and loving and of the existence of the objects of their love. What they desire, unless all has gone stale, and they want nothing (that is, annihilation and nescience), is the continuance and development of the processes they cherish. This, which the poets desire, we cannot by any means call impossible. But we must admit that, even in part, it is the sort of thing that in fact seldom happens. What is far more important, it is the sort of thing that happens very much seldomer than causally needs be.

This latter fact is one of the two existential foundations of all moral endeavor.

To assert the irreversibility of time as a universal ontological principle is therefore only to utter the truism (which is something else than knowledge of fact, since it applies without exception to facts not known and not now existent) that every process is what it is. Truisms of this kind are (as students of Spinoza and logic have recognized) the only statements which we can make (except such as are emotional outbursts) about the whole of being, about the world, about all reality. Some refuse to call such metaphysical principles, such truisms, statements at all. But whatever we may call them, I think they have a great corrective importance. It is only by neglect of them that confusion in metaphysics, as contrasted with mistakes of fact, is possible; for on analysis, confusions in metaphysics turn out to be the saying that some part, or pattern, or process, is more than itself (is even all possible reality), or that two structures are each the whole of being, yet are different structures, or something else of this kind. Does not the philosophical contribution of the objective relativists supply a striking illustration of the present conception of ontological principles? Do the objective relativists offer us any other ontological principles except the truisms (1) that every perspective is absolutely what it is, and (2) that there is no meaning in saying either that an element must, or that an element cannot, have a given structure in other perspectives, because it has that structure in one perspective? Is it not further true that the determination of the resemblances and differences of existential perspectives and their ingredients cannot be accomplished by philosophy? The objective relativists, as I understand them, have not asserted that it could. The determination is accomplished either by definition or by an empirical inspection of the perspectives in question.

In recognizing that every process is itself, we recognize that no process could itself be reversed; but at the same time we recognize that there is no metaphysical limitation which we can apply to the pattern of the whole of history. That pattern may include *anything*. It might well include aeons of events followed by other aeons of events exhibiting either a repetition of, or the symmetrically reversed pattern of, the events of earlier aeons. Only an in-

telligence that compassed in its experience and its conjectures both sets of aeons, would be able to recognize, or to mean anything by the hypothesis of, such repetition or reversal of pattern. Hence you or I, if we happened, as we well might, to repeat perfectly or to reverse perfectly a pattern in our histories, would never know the fact, for if we (you or I) did know the fact, then the concrete process would by this new knowledge be different in the second occurrence from either a repetition or a reversal of the first

Investigating, understanding, imaginatively transforming, and adjusting the currents of existence is the whole concern of human science, human art, and moral endeavor. But the philosophy of those currents' repetition and reversal is exhausted in these few words. No process can itself recur or be reversed, but anything that is conceivable under the name of "recurrence" or "reversal" may occur. To miss, or to confuse, these points is to be seriously misled: to grasp them, however, contributes nothing to positive knowledge or hypothesis with respect to which way the winds of process are blowing, have blown, or are apt to blow.

We locate events by their relations read off in terms of the three dimensions of space and the one of time, and, as Mr. Lenzen and Mr. Strong explained, any strand of events exhibiting the four dimensions of succession may be taken as a measure of time (or a clock). Men have taken, as clocks, strands of events more or less convenient to observe, and (which is equally important) having a rhythm easily commensurable with a large number of rhythms practically or theoretically interesting to human beings. The measurement of temporal "stretches" or "intervals" (not "empty," of course) in any area of events by such a clock, consists simply in the counting of the conventional units between the clock-event experienced as simultaneous with the beginning of the "stretch" or "interval," and the clock-event experienced simultaneously with the end of the "stretch" or "interval." It is impossible to give a description of experienced simultaneity that shall be altogether free from circularity (positive or negative). We have no experience of durationless points, and we could not give an historical report of such experience. Of events—all more or less "endurant"—two events, or two sets of events, may be experienced as being at any distance whatever to the right or to the left of, or above or

below, a reference event. But if the one is experienced, not as preceding or following the other, then the two are experienced as simultaneous. We might say further that either of the events called simultaneous may have an endurance shorter than that of the other, or coterminous with it. But this statement depends upon the definition of simultaneity, rather than expresses that definition. For it presupposes that we know what is meant by the simultaneity of the beginning of one event either with the beginning, or with some later stage, of the other event. As Einstein has shown us, we may not regard as either simultaneous or nonsimultaneous, series of events in systems moving with certain relative velocities, since we cannot by any means observe the respective beginnings and endings of events in the two series as simultaneous.

No man can tell another exactly and fully what he experiences simultaneity as. But one man can train another—as we train children and savages—in his method of selecting events as simultaneous, and of measuring the interval or stretch (not “empty,” of course) between one of these events and another that may follow it. But experienced events, experienced passages, and experienced simultaneous passages, are meager objects indeed, compared with the vast structures of events that astronomers and geologists describe to us as spatio-temporal, or compared to the histories (in one sense more circumscribed than the astronomer’s construction, in another less) as which we remember ourselves and the objects of our experience, or as which (taught by the historians) we conceive the career of a nation, or even that of humanity. Have we committed a *hysteron proteron* in trying to explain time in terms of experiences of passage, succession, and simultaneity, instead of in terms of the grander structures of science, of memory, and of history? Could such structures ever have been reared upon a foundation consisting only of such immediate data as experienced events, simultaneous and successive? Is it not more plausible to say that the data are really products of, or at least determined by, the grander constructions of science and history? Or, at the very least, are there not, as Mr. Lenzen suggested, nonempirical as well as empirical factors in time orders, whether concrete or abstract? And are not the nonempirical factors in some sense the controlling ones?

In dealing with these questions we must begin by correcting two common misunderstandings. One is, that to call a datum empirical and immediate, is to assert that it is something very simple, like a color patch—or even, as some say (though clearly their saying can refer only to nothing), something indeterminate, something devoid of quality, character, and structure. The second misunderstanding is that to call a datum empirical and immediate is to deny some part (or all) of the actual or imaginal context (whether causal, interpretive, or emotional) of the entity. For all I know, there may have been empiricists who used the phrase “immediate datum” with such intention. But I doubt whether the greater philosophers have done this. Certainly Aristotle, by *αἰσθησις* and *νόησις*, the great medievals (and, with different terminology, Descartes, Spinoza, Hume) by *apprehensio simplex*, intended the awareness of any objects whatever, simple or relationally complex, as contrasted with awareness of those objects as related to other objects which, although they might have generated them, could not be said actually to constitute them. And they did not mean to deny* (any more than do the empiricists of our day) that elaborate education is needed by anyone who is to discern the more interesting sorts and systems of objects; nor did they mean to deny any part of the *milieu*, causal or other, of the objects. Their position is really a warning against an error which idealists have so vigorously denounced, yet have themselves so commonly fallen into—the error of confusing the genesis of an entity with its nature and status. It is a fact—not an *a priori* necessity—that nothing is recognized by any organism in a vacuum from which training, interest, practical purpose, and theoretical interpretation have been pumped out. But when an organism has completed such training as is needed if he is to notice leaves blowing across the grass, what he notices is leaves blowing across the grass, and not the training, the practical purposes, without which (though of course also with which) he might never have noticed anything.

Perhaps some of the misunderstanding of recent empiricist or “positivist” statements has been caused by the employment of the phrase “atomic fact,” now abandoned by many who once used it.

* Witness Aristotle's *Metaphysics A*, and *Nicomachean Ethics*, Bks. II and VI

Such language was unfortunate, not because anything outlandish was meant by it, but because many students (by an association of ideas or by verbal analogy) were led to the amazing conclusion that the empiricists were either denying, or else on principle ignoring, the contexts of events and statements.

Consider first the alleged denial of context. When a man says that, if discourse is to be expressive, it is necessary that a set of similar terms (resembling say the sound "chair") be taken consistently to represent some set of similar objects (say chairs), he is in the first place saying nothing newfangled, but only what Aristotle said in Books Γ and K of his *Metaphysics* (and what has never to my knowledge been "refuted" or successfully "neglected" in expressive discourse); and, in the second place, by the empiricists' own "logic," it follows not only that his statement does not, but that it could not, deny any least one of the causal, historical, economic, biological, artistic, or other factors that comprise the contexts within which chairs have come, or may yet come, to be built, used, enjoyed, bought, sold, or within which language comes to be used. It is, indeed, a cardinal tenet of logic that no statement asserts any statement other than itself (or its "components"), or denies any statement other than its contradictory (or the "components" of its contradictory).

Next consider the alleged neglect (as contrasted with the alleged denial) of context by empiricism. The contemporary empiricists point out that in speaking of complexes (and, as they have seen and insisted, we cannot speak of anything else but complexes, and their term "atomic fact" was a name for a complex, a state of affairs, a *Sachverhalt*)—in speaking of complexes, however wide may be the scope of what we discuss, it cannot be unlimited. That is, we cannot at once say everything of anything. Now to deny this, to allege that one can say nothing either true or significant of anything except when one states its whole natural and "logical" context—to say this is simply to condemn us to speechless mysticism: to the view that nothing can be said. The only sense in which the contemporary empiricists or "positivists" can be judged to neglect context on principle, is that they have insisted that we can know and say something of a thing short of knowing and saying everything about it. And what, after all, is the way to do

justice to the contexts of facts? Is it not to explore and appreciate those contexts—and in certain fields, to construct them and reform them? Is there any way of stating the guiding hypotheses, the objectives, and the results of such exploration, except as Aristotle and the empiricists teach. that is, by saying what we find and what we suppose, and neither denying on the one hand, nor pretending to express on the other, its so-called total context?

If, by the charge of having neglected context, we mean that recent empiricists or "positivists" are simply more ignorant than other men—that, poor dears, they know less of history, less of psychology, less of science, less of the fine arts, than do other philosophers—then, of course, there is just one way to investigate the fairness of our charge. That would be by empirical examination of the philosophers thus compared. And of the sciences and civilizations and purposes of mankind, of which all men know little enough, is there any way to go about learning more except by that method described perhaps even better by Spinoza than by Dewey or other contemporary empiricists? In relation to this, is it not the clear occasional mistake of Platonism (among its thousand virtues) to have supposed that intuition of universal essences (such as those called Beauty or Justice) is aesthetically or morally more fruitful and instructive than empirical studies and technical labors in the arts and in political practice?

The existential processes by which anything comes to be, or to be noticed, are no doubt complicated beyond our dreams, and empiricists would violate their own explicitly stated "logic" if they denied any part of these. But what in any specified range occurs and is noticed is not other ranges of existence that may have produced it, or supplied its *milieu*, but is precisely what is noticed—however vaguely or sharply figured that may be. Those who tell us that interpretation constitutes facts, that data are constructs of explanatory systems, seem to mean one of two things, or a confusion of both. They mean either (a) that all that occurs has a context (in which statement all must heartily agree); or (b) that the context, particularly that part called explanatory, constitutes, or determines the character of, what occurs. With this last, how could we agree? For if we mean that data are amorphous and not objects of knowledge until categorially interpreted, we

must, in the first place, be equally acquainted with "raw" and with "interpreted" data in order to make the comparison. And, in the second place, if we followed the analysis sympathetically, and within its own terms, we should have to say that *the process of interpreting* itself eludes our awareness, is not given, cannot be referred to, and (which is quite fatal to the view) is not determinate, has no specific character, *until it is itself interpreted*. Now what we actually distinguish within experience as data and interpreting, observing and supposing, do go on together. Causally and existentially they are never divorced. But unless we distinguish these as sorts or areas of processes experienced and projected, we can mean nothing whatever by a theory that interpreting characterizes data. And whenever we *do* thus actually distinguish data and hypothesis, no possible discovery of their intimate existential relations could legitimately blur by one iota their formal distinctness.

We now turn back to the narrower problem of determining the respects in which the temporal is for us a construction. My own view is that time, as the ongoing of process in the dimensional relations I have described, is "given" in awareness, is an aspect of data. The present of awareness is *durée* or passage, not an instantaneous "point." Imaginatively and hypothetically we project events forward and back from present experienced passage. Thus, the unexperienced future and past are *for us* hypothetical constructions, framed and entertained in the passing present, and consisting mainly of predictions, and advice for the formulation of predictions. What we thus construct are *functional schemata of which the arguments are variables*. Our beliefs, our hopes, our notions of causal regularities, lead us to predict limits of variability for the variables. But all these predictions of limits are acts of faith. They do not constrain events, although they may include conventions the acceptance of which constrains our use of terms in describing events. Such hypothetical constructions, as elaborated in science and history, are generally vastly more interesting to us than the passing present. But can we, for that reason, regard them as the metaphysical foundations of the experienced events which were the point of departure for our constructing? No. For such experienced events are not only the historical spring-

board of our hypotheses; more, their pattern is what we borrow and project in both directions in our theories of past and future time, and of the limits of variation of the events that may comprise it. In their *ratio cognoscendi* (or better *construendi*) past and future are for us hypothetical structures. This does not mean, however, that past and future events in their *ratio essendi* depend in any way upon such constructing. Acts of theoretical construction and of speculation are themselves events in the stream of nature. They cannot intelligibly be called the producers of that stream. Although we cannot know such past or future events as are outside of present awareness, that fact gives us no ground for saying that our hypotheses *constitute* those events. If those called past occurred they occurred, ontologically independent of our hypotheses; though, for us, the assertion that any specified past event (past as outside of present experience) did or did not occur, can only be a more or less probable hypothesis.

I have now described what I take to be the relation of hypotheses concerning past and future events, to the present experience which is their logical and empirical basis. That relation is in a sense mysterious, for nobody pretends to know in detail the acts of inference and supposition which relate our notions of past and future to our present experience. But I submit that no other account is intelligible, since there is nothing but present experience to which to relate those as their basis. We trust our *habits* in this situation, just as any scientist trusts the accumulated reports of other investigators. But we should trust them with the same all-important reservation that is employed by the scientist—the reservation that any one of them may be found to require modification. Historically, of course, we believe that present experience is conditioned and produced by past events, including past events probably never experienced (although experienceable), and by expectations with respect to the future. But this belief is itself a present occurrence, it must ever remain a mere hypothesis entertained in some present with respect to some past. It could never become a known truth. There is (*pace* Aristotle and Dr. Whitehead) nothing impossible about the hypothesis, however incredible it may be (and I know of nobody who believes it), that no events preceded those which we date as having occurred ten years

ago And since that hypothesis is not impossible, no metaphysics could make it impossible and thereby make unexperienced past and future something more, for us, than hypothetical constructions. Of course any metaphysics or physics can include *suppositions* contradictory of the hypothesis that events began ten years ago. I suspect that those metaphysics which have tried to make certain our beliefs with respect to the past and future, have been aimed at an imaginary pseudo-skepticism which should illicitly infer that there was no past and will be no future, from the fact, that we have certain knowledge of neither. The polemic is exactly like that between two parties of zealots, one of which insisted that the theories of geologists about the remote past and the promises of physicians about our near future are necessarily true, while the other party insisted that these theories and promises are necessarily false, or even meaningless But that is a foolish dilemma The actual state of affairs, empirical and logical, is quite misrepresented by both extremes Our beliefs with respect to the past and future are, and can be, only probable, and neither necessarily true nor necessarily false Most certainly they are not meaningless. When Whitehead, as in his latest book,* belabors "positivism" as a philosophy that cannot know that there was a past or that there will be a future, he is simply belaboring his own and all other men's knowledge For no man could *know* either of these things, and philosophers who say they do, have merely postulated (as empiricists or "positivists" themselves are as free to do as are any other persons) what they wanted to believe

No, it will do us no good to try to say that the experienced present (as occurrent, as determinate, and as present) is constituted by a construction that includes the unexperienced stretches of past and future described and predicted by scientists and historians. The hypothetical constructions of past and future occur in, and have their basis of meaning and reference in, such present experience as may indeed have been causally generated by preceding events, but which was certainly not generated by our present hypotheses with respect to preceding events. Our beliefs with respect to the past must remain hypotheses, as surely as our first-

* *Adventures of Ideas*, Chap VIII.

borns must remain our first-borns, whatever we may do or say about either of these sorts of things. But it does not therefore follow that our belief that the past causally determines what follows it, is the belief that our present beliefs with respect to the past causally determine the present or the future (except, of course, with reference to some part of that very special strand in the future which may turn out to be an aspect of our personal and emotional histories.)

No man has succeeded in showing how, in full detail, the projection of past and future from present experience occurs—but no man has succeeded in showing in full detail how a rose blooms, or a leaf falls, or food is digested, or how anything else happens. We probably are more wonderful than we know. In our practice we are “wiser” than our science. We do what we do not understand. The greatest intellectual genius ever born would probably never have succeeded, quite by himself, in articulating with his present experience such hypotheses with respect to past and future as do the dullest children in our kindergartens. We tell children and savages repeatedly what we suppose they do not understand, and at the same time we condition their actions toward a similarity to the actions of ourselves who do understand, at least in part, what it is that we are saying. And the children and savages come to act and to speak as if they too understood. The unexpressed and unconscious adjustments involved in such understanding and such learning are no doubt *enormously* complicated.* No man has discriminated them all. It is equally true that no man has discerned in full detail the ways in which our references to past and future are hypothetical projections of our present experience. But, as we know them, of what else could they be projections? Indeed, what else but this could they be?

Professor Dewey sums up what I have tried to describe as the respects in which time, as concrete process and temporal character, is immediately given, and the respects in which time as unexperienced future and past, and the order of future and past, is for us a construction. “In fact,” Dewey writes, “*anything denoted is found to have temporal quality and reference; it has movement from and towards within it, it is marked by waxings and wan-*

* Cf. Wittgenstein, *Tractatus logico philosophicus*, 4.002.

ings”^{*} But “The translation of temporal quality into an *order* of time is an intellectual arrangement, and is subject to doubt and error. Although pastness and futurity are qualities of everything present, such presence does not guarantee the date at which Columbus discovered America, nor when the next eclipse of the moon will occur.”

In contrasting what is given as temporal with what is constructed in interpretation, we cannot, of course, return to a “pre-analytical” or prereflective innocence. We cannot, I suppose, even understand what such a state of affairs would be like. But we certainly cannot say that interpretation gives temporal (or any other) character to what would otherwise have *none*. For, as Aristotle and Spinoza and Berkeley and Hegel saw, what has no character is indistinguishable from nothing, and neither interpretation nor anything else can give character to nothing. If endless processes of interpreting are supposed *causally* to lead up to a given experience, no contradiction is thereby introduced, for causes can operate without being experienced. But if such endless processes of interpreting are alleged (as by some of the neo-Kantians) actually to *be* the character of the objects we experience, then not only must a beginningless process have been passed through (which is quite possible), but we must at the moment be fully aware of a beginningless and endless process of interpretation as being actually the character—say, of the tree as green, or of the flag as flapping in the wind. This, I suspect, is impossible—at least the statements of it which I have had the chance to examine are self-contradictory, and (so far as I know) nobody has plausibly alleged as a fact the observed occurrence of such acquaintance with infinite interpretative process. If we say that knowledge of such an infinite interpreting is simply *one with* any given act of interpreting, we are, of course, thereby lost (or saved?) in ineffable mysticism, or (if we prefer pragmatist phrases) in unconscious operations.

Events as given are in transition, and temporality is a dimensionally measurable aspect of concrete transitions. What we *know* of time, as passage, order, and measuring relations, is therefore

^{*} *Experience and Nature* (ed. 1, Chicago, 1925), pp. 22–30. Italics in first clause mine.

no more extensive than the field of events under immediate attention. Time, as order of events extending backward and forward from the present, is for us a hypothetical construction, framed and entertained in the present and consisting of (1) predictions (including the "reverse predictions" of historians and archaeologists); and (2) advice for the formulation of predictions, and for the measurement of the processes predicted if ever they fall under observation. We cannot regard the construction as itself the condition of those events which were the empirical and logical point of departure for our constructing, which were experienced as passing, and a part of whose pattern we borrowed and then hypothetically projected in both directions in our theories of unexperienced past and future. We can call time as construction real, in the sense of possible or intelligible, but as construction of what is not experienced we have no ground whatever for calling it real in the sense of existent, or manifested in existence. Thus the idealists and pragmatists have overlooked so far as they have argued that the present, as existent and determinate, is "the work of the mind," or "the product of interpretation" (whether operational or dialectical). Hypotheses about past and future are indeed "the work of the mind," or, much more accurately, are among the most important defining ingredients of what most of us call minds. Such hypotheses may profoundly influence our attention toward what is present, and our hopes and fears with respect to the shape of things to come. But whether the hypotheses are correct, whether predicted events do occur, and whether they have or do not have the characters and relations supposed, can be determined, not by any construction or hypothesis, but only by the observed occurrence or nonoccurrence of the approximately specified events.

Confusion on this last point is the price paid, as it seems to me, by such a philosophy as Professor Dewey's, so far as it refuses to distinguish truth from knowledge. Havings, Dewey told us in the first edition of his *Experience and Nature*, are finally the meaning and truth of theoretical constructions and interpretations. These havings, he said, are not noetic, are not cognitional, any more than your having a red-haired forty-second cousin, or high blood pressure, or incipient measles, need be "cognitional." Yet, Dewey says, all these crucial havings are denotable. Actually, of course, the

havings just instanced would make *true* any statements that asserted their occurrence. But how anyone should *know* whether his statements were true or false unless he were aware of his havings, unless (that is) his havings were noetic, no one can say.

Even as in the importantly modified second edition of his *Carus Lectures*, Dewey's empiricism has been criticized as not quite empirical enough. Yet no one in our time has stated more effectively than Dewey the fundamental philosophical thesis (basal to the present paper, and sufficient, I think, to remove Dewey's own theoretical difficulties) that all distinctions lie within experience, that they are comparisons, either of experienced areas, or of areas experienced with others not experienced but experienceable, or else of various unexperienced but experienceable structures. Attempts to refer to what cannot be experienced are attempts to think I know not what.

Many have learned this lesson by going to school to the empiricists—Berkeley, or Hume, or Peirce, or Dewey. But they could have learned the lesson as well at the feet of almost any of the great philosophers of our tradition not called empiricists. Aristotle's long and varied arguments for material and formal factors ingredient to all existents, are in part arguments for the thesis that whatever lacks either of these factors is inexperienceable; and about that we can say nothing, as by reference to it (as indeterminate) we can mean nothing. To be sure, Aristotle's *First Philosophy* represents at least one entity as inexperienceable—God. But the Philosopher's own medicine, if he had taken it as he prescribed it, would have cured him of the confusion of attempting to refer to a nonoccurrent activity (such as he called God), as surely as it cured him (and should have cured his successors) of attempting to refer to entities described as indeterminate.

Again, Spinoza tells us, not merely (as do some empiricists) that it is unmeaning, but indeed that it is blasphemy to say that there is anything inexperienceable, since in Spinoza's terms thought is immediate noting, and to say that there is any mode of substance which cannot fall under the attribute of thought would be to deny the infinity of one of God's (or Nature's) attributes. Indeed, Spinoza goes still farther—too far, as it seems to me, for a proposition that has at least synthetic form—and asserts

that it were blasphemy to say, there is anything not actually cognized. Of course we all know that Spinoza himself tried, nevertheless, to assert the quasi-existence of what on his definitions was unknowable—namely, feelings which, so far as cognized, are not feelings but clear ideas, and which must therefore be (as distinct from ideas, which are not feelings), nothing that we could cognize. But again, the medicine that Spinoza needed lay ready for him in his own first principles. He could have cured himself quite as well as could any empiricist physician or psychiatrist (to use the latter term in the Platonic sense).

Kant, with his limitation of categorially determinate statements to possible experience (a limitation which it is hard to see that his positive metaphysic succeeded in overcoming); Hegel with his insistence that such being as is indeterminate is indistinguishable from non-being—these, although they undoubtedly violated (as Heaven knows most empiricists have violated) their own insights on one or on many occasions, still testify, I think, to the doubt, or denial, of significance in statements that purport to refer to the unexperienceable. To see that professed empiricists have themselves been inconsistent in this fundamental, we need only remember that Berkeley, who enunciated the principle clearly, nevertheless offered a metaphysic of spirits and deity which violated the principle. And the interpreters of Hume still debate concerning how far those of his statements which verbally suggest reference to something unexperienceable are, or are not, sufficiently corrected by Hume's own analyses.

The point of this long digression, upon a theme that is nevertheless philosophically basal to all that I have said, is to suggest that nothing about the central insight lately called empiricist (or, with doubtful historical justice, positivist) is logically or historically limited to any one kind of metaphysics called "empiricism." I cannot, for example, agree with Professor Dewey when he writes* as if philosophical rationalism and recent mathematical logic were, as such, fundamentally inimical to, or offered an alternative to, his own central empiricist insight. The rationalism that could be so characterized would have to be one that supposed reason to be more than obstetrical—to be fertile in itself. Now there have, of

* For example, in *Reconstruction in Philosophy*, Chap. VI and *passim*.

course, been rationalist statements to that effect; but also there has been no clearer exposure of them and warning against them than those expressed in the writings of the great "rationalist," Spinoza. On the one hand, Spinoza insists that the mind has no ideas of modes, no science, except the ideas which are particular bodily modifications of Substance, noted. On the other hand, Spinoza's rationalist metaphysical statements about God and his attributes and existence, turn out on a study of his own definitions and axioms, to be entirely negative, or else truistic, in import. They are various ways of warning us that everything we might try to say of God or Nature as a whole will be meaningless, except only the truistic statement that it is nothing less than "All in All." I suppose this is the only statement about all being which the theory of types leaves open to any of us to make.

The mathematical logicians who have developed, among other things, the theory of types just mentioned, far from holding a position opposed to empiricism, have rather given us the clearest of all contemporary statements of the view that we have no way of meaning anything nontruistic when we call a statement true or false, except by a reference to experience. Is there any living logician who commands the serious attention of his fellow workers, but agrees with Dewey that, if sets of propositional or any other signs are to mean anything other than themselves, that meaning cannot be given them by analysis, by "logic," by "reason," or by anything else except some sort of reference to the experienced and the experienceable?

This meeting of extremes in historical and contemporary philosophy, stressing as it does a great classical theme, seems to me an indication of a unity in philosophical method and objectives—a unity which was once the object of Plato's enthusiasm, but which has since been unduly obscured by the quarrels of the schools over supposed (I think quite mistakenly supposed) metaphysical and logical alternatives. To recapture that sense of the meaning and objectives of philosophy, might rescue our studies from unprofitable polemic, and give them a fresh vitality.

The foregoing interlude on the so-called empiricist insight seemed necessary to avoid the commoner misunderstandings to which an empirical analysis of time might be subjected. We may

return to the last brief section of that analysis by noticing that one of the considerations which have led neo-Kantian critics (such as Cassirer and Spranger) to insist that unexperienced past and future are, for us, more than *hypothetical* constructions, is their view that an empiricist could not know what he meant by such past and future unless they, with his present, were all cast within the frame of a categorially determined, enjoined, and formally guaranteed construction. But if we report our experiences scrupulously, do we not find ourselves agreeing with Dewey in saying that we know what we mean by pastness and futurity because we experience "movement from and movement towards" directly in whatever we are aware of, and not that we know these as guaranteed by categorial presuppositions? There is then no theoretical difficulty about our making suppositions, or constructing hypotheses, with respect to unexperienced ranges of events in specific temporo-spatial order.

But there is another alleged aporia in the theory I have presented. Many empiricists since Peirce have said that a theoretically unverifiable hypothesis is meaningless. Are hypotheses with respect to an unexperienced future, theoretically incapable of verification? If they are, it will hardly follow that such hypotheses have some underlying categorial ground for their significance. What will follow is rather that the alleged hypotheses are inexpressive combinations of words.

But judgments with respect to future events are not theoretically unverifiable. They would be (and not merely for an empiricist—but for anybody whatsoever) if it were demanded that the *verifying* occur simultaneously with the *supposing* of something by definition not present. If today I predict rain tomorrow, I certainly cannot verify that prediction today, and when I do verify it, the utterance of the words "rain occurring at noon, March 3, in Berkeley" will no longer be a prediction. It will be, instead, a true or false statement with respect to events contemporaneous with its utterance. All these are facts which any philosophy must admit. They are not difficulties conjured up by, or peculiar to, an empiricist theory of time, meaning, and truth. The date of a statement's occurrence need not be the date of the occurrence which the statement specifies.

But we are frequently asked, When we do come to that juncture of events which we say a prediction specified, how can we ever know it is the sort of juncture specified, since the prediction was an event of the past? Now the stretch of continuous awareness—of the so-called specious present—occasionally embraces both prediction and verification as when we hear an expected resolving chord in a sonata while we are still hearing some of those preceding chords which led us to expect it. Where prediction and verification do not thus fall within a present strand of process, an empiricist, like any other thinker whatsoever, can mean by the verification of a prediction only the observed occurrence of such events as he remembers, or as his notebooks record, as previously predicted. If the occurrence of a predicting is not within the present of verification, no theory, no categorial structure, no metaphysical postulate whatever, can give meaning to the verification in one present of a statement about the past (for example, that I yesterday *predicted rain*) and of a statement about the present (for example, that it is now raining here). A man may have his diaries and records before him, he may read in them, and remember (or not remember) his predictions of yesterday or of twenty or of ninety years ago. If he ask, Did I actually make these predictions? he could not reach a certain answer even by traveling back to yesterday or to the events of twenty or ninety years ago. We do not know how to embark on such a journey; but if we did, and reached our destination, we should only know it if we could know in the yesterday, or the 1914, or the 1844 to which we had returned, that the records of 1934, which we might have with us in our luggage, corresponded with the events of 1934. Unless a specious present of awareness included both processes as distinct, to return to the past would be to live through a process that went in two contradictory ways at once. At this moment (in March, 1934) we may say significantly, "Cherries bloomed in March, 1933," and "Cherries will bloom in March, 1935." We know what these statements mean, for we can specify within hypothetical constructions of past and future with any required degree of detail, what events would make them true. But short of a not-impossible (but presumably nonoccurrent) stretching of present awareness, we do not in fact find ourselves, in any present, aware of the occurrence of the flow-

ers of 1935 *and* of the predictions of 1934, or of the occurrence of the rememberings of 1934 *and* the flowers of 1933. If this situation distress us, it will do us no good to alter our theories of time or our metaphysics, for to "postulate" something as actually experienced, when it is not actually experienced, could hardly console the most determined "willer to believe." Our only alternative is either to accept as hypothetical construction—mere hypothesis, though (of course) significant hypothesis—what is for us hypothesis, or else to submit ourselves to a regimen for stretching the scope of our attention. Though we may reasonably expect some benefit from such a regimen, it were overoptimistic to hope to achieve a present acquaintance (such as some of our contemporaries promise us) with the occurrence of Caesar's wounds and death.

We have considered, as well as we could with such brevity: (1) the senses in which temporal quality and order may be called real or unreal, and the senses in which temporal dimension is distinguished from other dimensions of succession; (2) the sense in which events with temporal quality are data, and the sense in which orders of variable events, past and future, are for us hypothetical constructions, (3) the problem, whether constructions so elaborate as those developed by our historians and scientists are, in cognitive content, projections from present experience; and (4) the problem, whether, as some say, statements concerning a future not experienced must be senseless for an empiricist because incapable of verification. I shall conclude with a brief treatment of one last question, Are there many orders of time?

Of such spatio-temporal series (that is, series of events) as can be described, it is hard to make out the sense in which they constitute many "times." The physicists of our century have taught us that events and their intervals do not alter in the innumerable mutually equivalent translations of the magnitudes of the temporal and spatial dimensions which measure their intervals. The various clock systems that *are* accessible and usable are not metaphysically alternative time orders, for the measures on any of them are translatable without remainder into measures on any other clock system that is logically accessible. We might say that pendulum swings and pulse beats gave us alternative time schemata, and then suppose ourselves in position to tax the empiricist

to tell us just why one of these is a better clock than the other. But even with respect to convenience there is no difference whatever between measuring earth rotations against heartbeats, and measuring heartbeats against earth rotations, since so far as the correlation were carried out from either end, the content stated in the report of it would be identical with the content stated when the correlation was measured from the other end. If, however, pervasive uniformities are what we want to find and formulate, we neglect heartbeats, and correlate pendulum swings, earth rotations, and the like. But to say that successive segments of these latter are more probably isochronous than successive stretches of heartbeats is quite senseless, unless it either expresses or depends upon an arbitrary definition of some sorts of successive segments of some strand of process, as what one means by isochronous segments. In that case we ought to say clearly, not that successive earth rotations or pendulum swings are more probably isochronous than successive pulse intervals, but that they are what we define as isochronous, and as unit measures in our clock system.

The situations which prompt us to say that there are many times, and not merely many occasions, are not those involving the tremendous velocities whose complicated problems we must leave to the physicists and mathematicians. Rather they are the familiar experiences of swift-flowing stretches in our personal histories as compared with the tedious, drab, interminable hours—to which, I am afraid, lecture audiences are no strangers. Now, we have no difficulty whatever in *measuring* the tripping and the dragging hours against one another, or against any strand of events agreed on as a clock. Men can fulfill their commitments to labor (with “atomic guns,” or with telescopes, or with harvesters, or with ledgers), or keep tryst with their friends, quite as punctually after minutes that have been age-long crucifixions (in which they may say they lived a lifetime) or after hours that have sped like light, as they can after more commonplace serial experiences. That Juliet who implored her departing friend.

I must hear from thee every day in the hour,
For in a minute there are many days

—that Juliet had on the same day no difficulty in planning with Friar Lawrence her forty-two-hour sleep. No series that we ex-

perience, called emotional, or mechanical, or historical, or operational, can resist measurement by any *accessible clock*. That seems to mean that all events, which we can exhibit or point to or communicate or measure, form one time series—in the sense that none of them can command exemption from, or incompatibility with, or metric untranslatability into the terms of, any accessible temporal measure system. And it means also that whatever process we agree on as the unit of measure cannot be *described* as itself speeding up or slowing down. Some say this is all that counts as temporal; that anything else, as inexpressible, is negligible, that of all things in space-time we had best say (on analogy with the famous statement of Planck) that what can be measured is real, what cannot be is nothing spatio-temporal. Not so, the consistent empiricist. As with the sound and color qualia which we cannot express in judgments, but which we may delight in beyond all things expressible, so with the insufferable slowness, or the heartbreakingly speedy passage, of processes which, as measured by any clock, are not different from so many pendulum swings. These slownesses and swiftnesses, if we feel them and as we feel them, though not as we measure them, are as real and mutually as different as any entities in the world. Have I fallen into confusion by trying to make this distinction? Am I offering as different temporal series what are only different events, or different numbers of events, or different shapes and colors, or different emotional qualia, experienced in what is still the same temporal order—the same, since the measurements of the events can be translated into any clock system we please? No, I think not. For what I have called the different times are not merely such different nontemporal qualities, such different pleasures and pains as could, by a distinction of reason, be *separated* from time as an aspect and dimension of process. We can set no limit to the number of events that may be found or significantly supposed between any two that should be taken as boundaries of an interval. What I refer to are not pains or pleasures or numbers of events, but incommensurable species of the very quality of temporality, of ongoing, of “*waxings and wanings*,” itself. If these species are incommensurable, I suppose they are inexpressible. Indeed, the statements that best suggest them say nothing at all about the number or measures of events, nor of any painfulness

or pleasantness that may mark them. They are, I judge, such terse lines as Sappho's

Δέδυκε μὲν ἃ σέλαννα,
καὶ Πληΐαδες, μέσαι δὲ
νύκτες, παρὰ δ' ἔρχεται ὦρα,
ἔγω δὲ μόνα κατεῦδω.

which, following, yet varying Huxley, we may translate "The moon has gone down, and the Pleiads. It is the middle of the night, and time passes, and I lie alone." In these lines Sappho has said nothing of incommensurable temporal qualities, though to most readers she suggests them beyond the skill of other poets. Now if such incommensurable qualities are unexpressible, we can only keep silent about them or else say, as Sappho did, what can be said. But if we enjoy them (or suffer them) it would be as wrong to try to deny them, as it would be impossible to succeed in denying them, whatever might be the philosophical fashion of the hour. Certainly the strict empiricists of our day, although they are almost universally misinterpreted as so doing, do *not* hold that the world, or reality, is limited to what can be expressed. We may not be able to say what the various incommensurable temporal qualities are, or even what is meant by saying that others may enjoy them. But this fact gives us no right—as indeed we have in any event no capacity—to say that such various felt incommensurable sorts of becoming and duration are nothing real, or that they are enjoyed or suffered by no one but ourselves.

THE NONSPECIOUS PRESENT

BY

J LOEWENBERG

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TIME IS A SUBJECT concerning which speculation may still sow its wild oats. No theme presents to a like degree such a mixture of familiarity and strangeness. Saint Augustine's confession regarding time is too universal not to be echoed: *Si nemo a me quaerat, scio, si quaerenti explicari velim, nescio*. The first part of the confession indicates the reason for taking time so much for granted. What need is there to make a problem of what everybody knows? Familiarity, we have been told, breeds contempt. And this is perhaps one explanation of why the philosophers have shown little inclination to take time seriously. Time is too much with us. As the hero is no hero in the eyes of his *valet de chambre*, so time appears unimportant to us who are continually aware of its flow. Yet to be intimate with time is one thing, to comprehend its nature is quite another. The hero's character is but rarely understood by his valet. Timeservers, in more senses than one, we have recourse to weird speculations once we are called upon to account for our master's idiosyncrasies. The various "explanations" of time proffered by philosophers are anomalous enough to bear out fully the second part of Saint Augustine's confession.

One favorite explanation is that our conception of time is built on the immediate experience of the specious present. The specious present is alleged to be the *minimum sensibile* of time, a moment so brief that the relation between its parts cannot be distinguished. If, while experiencing such a moment, the subject could distinguish priority from subsequence, the moment would not be entitled present. It is called "present" because it seems instantaneous, and this present is called "specious" because it is actually durational.

The notion of an instantaneous duration, applied to the shortest period of time that we are capable of experiencing, epitomizes Saint Augustine's dilemma. What more familiar than the enjoyed

or intuited present! If I am not asked to define or describe the present, I know very well what I mean by the experience of it. Whenever I have occasion to report that something is now occurring or is now occupying my attention, the term "now" is used by me with no consciousness of its paradoxical nature. It is a term signifying presentness from which pastness and futurity are intended to be excluded. What is present is manifestly not absent; the present is therefore in opposition alike to the absent past and the absent future. But as soon as I am induced to state what precisely presentness is to mean, my embarrassment grows apace. For presentness, from which pastness and futurity are literally absent, coincides with the absolutely instantaneous, but the absolutely instantaneous is the very negation of temporality. The concrete present experienced must be viewed not as instantaneous but as durational. It is a grain of time with earlier and later phases embedded in it. The instantaneous and the durational, if taken in an absolute sense, are logically incompatible. An instantaneous present cannot be durational, and a durational present cannot be instantaneous. Yet in some way it must be both; for the noninstantaneous could not be experienced as present and the nondurational could not be experienced as temporal. How explain the union of opposites? To save the temporality of the present, I must deny genuineness to its *felt* presentness. Only a present not truly so can be at once instantaneous and durational. Although the concept of an instantaneous duration is logically offensive, it aptly names what we are supposed to find in immediate experience. But the logical offensiveness of the concept is mitigated by the fact that what it names is after all specious and not real.

What a shaky foundation for a conception of time! Our original temporal experience is alleged to be unreal, and the analysis of it brings into play terms that are mutually exclusive! If the intuited present is spurious and the description of it contradictory, whence its seductive charm for such a multitude of philosophers? The answer is simple. No account of time, if our suppositious temporal experience is to provide the basis for it, can manage without the specious present. To jettison it is to forsake experience as the key to the mystery of time. But this, as we shall soon see, is to explain the *obscurum per obscurus*

Does the present lose its speciousness when viewed as a duration block more extended than that represented by the *minimum sensible*? I do not think so. Any present greater than the *minimum sensible* is certainly composite, exhibiting as it does recognizable differences of past and future. Within such a present, past and future are not merely implicit; both are unmistakable parts of it. A remembered period and an expected one are inseparable from any present perceived as durational. Consciousness of the absent, through memory and expectation, is, as it were, simultaneous with the consciousness of a present of which the span exceeds that of the *minimum sensible*. Let us call such an extended present the "conjunct present" in order to distinguish it from the *minimum* of duration which we may designate as the "intuited present." The names do not matter. They are only expedients to mark the difference between an immediate present and a present not immediate. The term "specious," if I am not mistaken, has been commonly appropriated for the intuited or immediate present—a present which, if durational, must consist of a coming and a going, with an interval between them, differences not consciously discriminated, our inability to discern them causing the illusion of instantaneousness. The conjunct or mediate present, however, a present always larger than the so-called "specious" one, is a present in which memory and expectation begin to play a conscious rôle, and in which consequently past and future are felt to be component parts. Such, we are often told, is the present of ordinary experience.

In what way is the conjunct or mediate present actually present? If the past and future are incorporated in it, the present of ordinary experience is doubly specious. It is so in the general sense of the term, in the sense of being apparent or deceptive. And it is specious also in the special sense in which the term is used to describe the intuited present; the conjunct present, as I shall show, involves an intuited one in its composition. Let us consider each form of speciousness in turn.

The conjunct present is but present by courtesy, so to speak, if past and future are drawn within its orbit. If the present has a duration longer than that of the *minimum sensible*, be it a minute or a day or a year, it is difficult to see in what its presentness

is to consist. The present minute, for example, may indeed be distinguished from a past minute or a future minute in accordance with some conventional scheme by which we measure and date a durational length. The same may be done with a present day or a present year. But each period thus distinguished is a conceptual unit recognized as composite. A present minute, however measured and dated, is a durational whole made up of successive parts which must be designated respectively as past, present, and future. If there is any sense in speaking of a minute as present, there is also a sense in speaking of a present within that present. And which of the two presents is the nonspecious present? Neither, of course. The present within the present, if viewed as the *minimum sensible* of duration, is specious in the special sense of that term. And the conjunct present, be it a minute or a year, cannot be experienced as such, if a vanished past and an impending future are said to be compresent with it. Experientially, it is not the actual past and the actual future that are compresent, but only the past that is remembered and the future that is awaited. The presence in the conjunct present of past and future is a vicarious presence. The conjunct present, being a durational whole from which the vanished and imminent parts are actually absent, is but an apparent and not a real present. There is a conjunct present, provided that in a narrower present within it memory resuscitates the dead past and expectation forecasts the unborn future.

It is impossible to *experience* a conjunct present without the aid of an intuited present as the vehicle of its conjunction. Without an intuited present, there is no conjunct present. Two considerations suffice to substantiate this assertion. In the first place, how can any moment be called past or future unless we view it either as being no longer or as being not yet a *present* moment? Memory and expectation are bridges not to the void, but to the present that was and to the present to come. A past moment is nothing else than a moment once present, and a future moment is one destined to become present, and present in precisely the way in which the intuited interval between them is said to be present. Every moment must appear as a specious present, such as is exhibited by the *minimum sensible* of duration, if it is to be an *experienced* moment, the distinction between remembered and

expected moments being a distinction between vanished and imminent specious presents. A conjunct present is but the continuity and synthesis of specious presents, a continuity and synthesis wrought by memory and expectation. Thus, the intuited present is fundamental to the conjunct present. In the second place, assuming that the conjunct present is a succession of intuited presents, depending for their continuity and synthesis upon our ability to recall the moments that are gone and to forecast those that are to arrive, *when* precisely do we recall and forecast them? To raise the question in this form is to endow the intuited present with peculiar preeminence. For a remembered past or an anticipated future must be remembered or anticipated *now* or at *this* moment, otherwise the conjunct present would have neither focus nor direction. The focal point in the conjunct present is always an intuited present, a moment perpetually moving and changing place, like the celebrated waves that "make towards the pebbled shore"; and the double direction of past and future is determined by each successive intuited present, so far as memory and expectation can be lodged there. How in an infinitesimal wavelet of duration, with which the *minimum sensible* of time is identified, memory and expectation could occur, is indeed a puzzling matter, on the assumption that a fleeting moment of microscopic length is the temporal datum of *immediate* experience, an experience in which distinctions of past and future are actually not detected. But where else could we find the locus of memory and expectation? Their only status is the occurrence of them *now*, and it is only because they are always present that the absent past is not annihilated and the absent future not unacknowledged. Memory and expectation must be present memory and expectation if the function of the one is to revive the past and that of the other is to prefigure the future. And if present memory and expectation are to be experienced as present, the present in which they are experienced must be the intuited present and not the conjunct one, since the latter is only possible if lapsed and emerging moments are vicariously embraced in the perishing instant called *now*. Impossible as it is to detect in an intuited present the memory of an earlier and the expectation of a later intuited present, such memory and expectation must somehow be simultaneous with any in-

tuited present. How otherwise account for the conjunct present, the alleged present of ordinary experience? Each successive intuition of an instant, it would seem, must possess in some mysterious fashion the capacity to reproduce and adumbrate instants *not* intuitively present.

In speaking of the specious present, we are thus required to distinguish between two forms of it, the conjunct specious present and the intuited specious present. The conjunct specious present, indefinitely extensible, is tripartite; it is a durational whole, of which one period has gone, another is elapsing, and a third is to come. In thus being tripartite, the conjunct present precipitates at once the familiar problem, how its successiveness can be reconciled with its continuity. It is obvious that both aspects of the conjunct present are fundamentally antagonistic; we must imagine it as a temporal succession, and in such a succession instants are perpetually dying and are perpetually reborn. How secure the continuity of moments each of which expires with its first breath? The answer is that we cannot experience their actual continuity if what we actually do experience is their succession. The continuity that we experience is, as we have seen, a vicarious continuity: the successive instants are continuous because *at* each of them the earlier presence is said to be remembered and the later anticipated. But if memory must resurrect what is dead and gone, and anticipation prefigure what has not come to life, and thus *at* each new and successive instant, what marvellous importance and potency accrue to the intuited present! For each experienced instant is nothing but the intuited specious present, and in such a living present ghosts of the departed and expected instants must join hands to produce continuity out of mere succession. But this is worse than building on quicksand. The conjunct specious present has no source other than the intuited specious present; the latter is the ever-shifting center for the former's movement and direction. The intuited specious present, however, when suffered to play this dominating rôle in the conjunct specious present, is so anomalous that a mere whiff of criticism may scatter it to the winds. Consider the absurd demands we must make upon it. The intuited specious present, if intuited at all, must be intuited as an instantaneous duration, for otherwise it could not be called

present in the strict sense of that term. But in an instantaneous duration, aside from the fact that it is a conception logically monstrous, not unlike the conception of a round square, no succession could be discerned; if the duration could not be *felt* as instantaneous, in however illusory a manner, presentness, as distinguished from pastness and futurity, would have no basis in actual experience. Yet, in spite of the fact that feeling of presentness precludes discernment of succession—and this is the reason for disparaging as specious the feeling of presentness, since the *minimum sensible* of time must be actually durational if actually temporal—the present should be intuited, not only as internally successive, but also as continuous with instants external to it, instants not yet present and present no longer, in order that the conjunct present might have its anchorage in immediate experience. Intuition, in a word, must yield a present at once instantaneous, successive, and continuous. But these three aspects of temporality no single intuition is capable of revealing. What is felt as instantaneous cannot simultaneously be felt as successive, and what is felt as successive cannot by the same intuition be felt as continuous. Either intuition is not or it is the foundation for instantaneousness, successiveness, and continuity. If the former, direct acquaintance with temporality is out of the question; and if the latter, direct acquaintance with temporality involves a mode of experience essentially miraculous. This is a dilemma manifestly ineluctable.

But is the dilemma ineluctable? Something, it will be urged, is wrong here. Of the two distinguished presents, the intuited and the conjunct, perhaps but one is specious, and, being specious, cannot serve as an index to the nature of temporality. Which of the two is specious, and on what ground?

It must be noted first of all that speciousness is not absolute. The speciousness of either present is a qualified one, depending upon whether we heed the demands of analysis or those of experience. We may impugn the intuited present as analytically specious, and the conjunct present as specious experientially. Let us see how the speciousness of the one may be contrasted with that of the other.

There is nothing specious (it may be maintained) about the

intuited present, when we do intuit it, so long as we refrain from analysis. Everything intuited is intuited truly; the opposite is not intuiting it falsely, but not intuiting it at all. About intuition, as about taste, there can be no dispute. How gainsay an experience whose enjoyment is vouched for by asseveration? Thus, the present as intuited is not a present speciously intuited, but a present really intuited; the present, and not the intuition of it, must be *described* as specious, simply because analysis can discern in the shortest "duration block" two incompatible features, one in virtue of which it is a "duration" and another in virtue of which it is a "block." As a single "block," its presence must appear as instantaneous, but as a block of "duration," its presence must appear as successive. And since instantaneousness and successive-ness are contradictory epithets, the term "present," if appropriated for the *minimum sensibile* of time, is a sort of solecism which the adjective "specious" is designed to emphasize. A "genuine" present must have but one synonym, namely, the instantaneous; it cannot coincide with its antonym, which is the durational, without forfeiting its claim to be a real present. This, of course, is unexceptionable as analysis. The analytic discovery that the present is a conception harboring its own antonym, makes illusory the verdict of intuition, on the principle that specious is everything of which the description is logically awry. But that principle we may challenge, replacing it by the counterprinciple that intuition and analysis are not homologous. What intuition finds is one thing, what analysis does with it is quite another. Whence the jurisdiction of analysis over intuition? The ability of analysis to detect in the intuited present logical incongruity does not affect its preanalytic status. The present is what it is originally intuited as being; if subsequent analysis repudiates it as irrational, two conclusions may be drawn from this repudiation. We may conclude that the intuited level of experience is a level *sur generis*, and that whatever transpires there becomes inevitably falsified as soon as it is surrendered to the dissolving work of analysis. Or we may conclude, granting the competence of analysis to invade the sphere of intuition, that the *logical* impossibility of intuiting something does not preclude *actual* intuition of it. The mystics of all ages have insisted upon these two considerations; they have maintained that what they

intuit is not amenable to the falsifying canons of analytic description, and they have averred also that logical absurdity produced by analysis does not prevent their awareness from being the awareness that it is. The intuited present can thus not be called specious simply because for analysis the instantaneous is at loggerheads with the durational, so far as the present exhibits to intuition a fusion of these opposed features, it is nonspecious for the intuition that experiences it.

As the intuited present is but specious for analysis, so the conjunct present appears specious when taken experientially. For the conjunct present is not a microscopic duration block, but rather a macroscopic duration spread. And as such it may serve to epitomize all time. So long as the present is not limited to the *minimum sensible* of duration, it matters little to what measurable period we apply the term. The principle is the same whether we speak of a present minute or a present century. Whichever we do, the present is a period extending from here backward and forward. If any duration called present is capable of including within its spread periods that are receding, lapsing, and coming, then the earlier and the later parts of that present may have any assignable limits or no limits at all. There is no impropriety in viewing all time as a conjunct present if from some arbitrary point of departure, and relative to it, one temporal vista lies in the background and another in the foreground. But the point of departure, occupying a middle position, must first be chosen. A conjunct present, then, having a spread which is extensible *ad infinitum*, is not specious, if the essence of temporality is such as analysis requires us to conceive it. What we mean by temporality, in abstraction from anything having that character, is a duration spread made up of periods which are themselves duration spreads. These successive duration spreads, to be successive, must actually succeed one another in continuous fashion, generating a series in which analysis is able to discern the earlier from the later in relation to some period conceived in the act of lapsing. Successiveness and continuity of periods, which a temporal series must logically exemplify if it is to be thought of as a single duration spread, are features discovered *through* analysis when a conjunct present, be it a minute or a century, is given *for* analysis. There is nothing specious here,

provided we understand by the nonspecious whatever accords with the results of analysis. The conception of a conjunct present, being a conception, analysis can certainly cope with.

Analysis, however, does not in this instance analyze itself; it requires a preanalytic situation to operate upon. The preanalytic situation is either the intuited present or the conjunct present. The former, though alleged to be experienced, becomes upon analysis a solecism, synonymous as it is with its own antonym. The latter has nothing to fear from analysis; all the elements needed for temporality are given when a conjunct present is given. If what is given is a duration spread and not a duration block, analysis *must* discern its moments to be successive, and successive *seriatim*, each occupying the same shifting position between its predecessors and successors, so that each, in the act of lapsing, is the moving link between the moments that have elapsed and those still to arise, the whole series of crawling moments being the given conjunct present. But in what manner is the conjunct present "given"? It is certainly not given as the intuited present is given; the latter is supposed to be a deliverance of direct experience. Of a continuous series of successive moments we can have no immediate awareness; each crawling moment crawls away irrevocably—if given immediately, it is given once and never again. A continuous series of successive moments, to be experienced at all, must be experienced indirectly, through the agency of memory and expectation. But this culminates in the paradox already noted. For nothing but *present* memory and expectation, one *now* reviving the past and the other *now* forecasting the future, can serve as link between successively experienced moments. Such a link, however, is too fragile to establish continuity. Aside from the difficulty of making intelligible memory and expectation as *present* (for their presence coincides with that of the intuited moment, and with the passing of the intuited moment must go irrevocably the memory and expectation it included), the continuity which memory and expectation make possible is a vicarious continuity. The continuity they make possible is one between a present moment and what *at the present moment* happens to be recalled and expected. In other words, the conjunct present, conceived as a continuous series of successive instants, cannot be experienced as such. Any attempt to make it

amenable to experience proves abortive for the simple reason that there is no avenue to the earlier and the later instants of a duration spread except through their shadows which a Janus-faced moment casts before and after. Because of the impossibility of surveying the actual continuity of successive moments, the conjunct present, though manageable by analysis when we confront it as a logical conception, is no datum of immediate experience. The conjunct present, nonspecious for analysis, is essentially specious when we seek to find support for it in terms of direct acquaintance.

The antinomy that we have reached is ineradicable if to the present we are obliged to attach the epithet "specious," either on the basis of analysis or on that of experience. We need a nonspecious present to keep time itself from collapsing like a house of cards. Without a real present there is no real past and no real future; for the past was and the future will be present. To condemn all presentness as specious is to stigmatize likewise the present that has elapsed and the present that is to arise. And is there any meaning in the assertion that time is nothing but a chain of specious presents? The distinction between the intuited and the conjunct present affords no escape from the difficulty. For neither, as we have seen, enjoys nonspeciousness in any other than a Pickwickian sense. The intuited present is specious for analysis, and the conjunct present is specious for experience. To select one as nonspecious is to refrain either from understanding or from perceiving the nature of temporality. For the present as *intuited* is logically monstrous, and the present as *conjunct* transcends actual awareness. We are thus reduced to Hobson's choice—the choice between mystic acquaintance and conceptual construction, one bringing in its train disparagement of analysis and the other distrust of experience. But such a choice is a desperate one. Must the present of necessity appear either as intuited or as conjunct?

The choice between an intuited and a conjunct present, leading to the *impasse* noted, seems unavoidable so long as the assumption dictating that choice remains unchallenged. The assumption is that time can be considered by itself, in abstraction from anything having temporal characters and relations. Assuming as true that, as Kant held, time cannot be thought away, though we may think away everything said to occur in time, this proves nothing more

than our *incapacity* to imagine occurrences as timeless. We must think of occurrences as occurring, that is, as occupying some duration block or some duration spread. As for the *capacity* to imagine time without occurrences, supposing such a capacity to be general—a matter which is open to doubt—this is not the same as the capacity to perceive it in isolation or the capacity to define its intrinsic properties. By what image can we conjure up the vision or conception of *pure* time or time *as such*? Is it a moving image of eternity or an eternal image of motion? Either image suggests mobility, and mobility is unimaginable without “something” capable of coming and going. Let us think away that “something,” and then nothing is left to move, nothing to pass in continuous succession. Pure moments of which pure time is said to consist can be imagined neither as successive nor as continuous—not as successive, because each in being present is present absolutely, containing nothing *by* which to distinguish it from the others as earlier or later; and not as continuous, because no pure moment can occupy another, carrying with it its own past and hastening toward its own future. In homeopathic bits of empty time I can envisage no passage, no transition, no advance. No wonder the intuited present and the conjunct present revealed themselves as specious, one to analysis and the other to experience, for we treated them as if they were pure, that is, in abstraction from anything said to *be* present. The paradox lay in taking the present by the forelock in order to pounce upon its quiddity, as if that could be found apart from an objective context of things and events. If, on the authority of intuition, the essence of the present is identified with an instantaneous duration block, how easy for analysis to show its logical incongruity! And if, in accordance with the demands of analysis, the present is asserted to be essentially conjunct, an extended duration spread of successive and continuous moments, what an enigma for experience! The situation is incorrigible; it results from the erroneous belief that time has an independent nature which either intuition or the intellect should be able to divulge.

The belief in pure time and the belief in a nonspecious present are mutually exclusive. To cling to one is to surrender the other. Those who defend their belief in pure time, either on the testimony of intuition or on the basis of analysis, are faced with endless para-

doxes. The denial of time as pure is requisite for the affirmation of it as nonspecious. Pure time is a fictitious substantive assumed to possess in its own right discoverable properties and relations. The reality of time is not substantival but adjectival; it is a *characteristic* of things and events, a characteristic which acquires its true adjectival form in the term "temporal." And by adjectival, of which the opposite is substantival, I wish to connote both the qualitative and the relational, a relational quality is certainly a legitimate kind of quality. For the nonce, however, it is not necessary to expatiate on the distinction between qualities and relations so long as both are conceded to be nonsubstantival. Time, viewed as a predicate illicitly substantivized, loses its independence; its meaning lies solely in connection with what it is a predicate of.

As adjectival to things and events, time is no longer at the mercy of the *ipse dixit* of intuition. We do not intuit things and events; we know them by observation and inference. We make judgments concerning their stuff and structure, and we advance theories of their origin and behavior. Whatever knowledge we have of them includes knowledge of their temporal characters and relations. There is no reason for supposing that such qualities and relations are the only ones to plague our noetic powers. Their being does not consist in being intuited. The specious present of the intuited kind belongs, with Berkeley's *esse est percipi* and with like subjective maxims, to the realm of perverse, if quaint, ideas. To compact the temporal nature of things out of specious presents is as fanciful as to concoct their physical nature out of sensations. All attempts to reduce the nature of things to immediate sentience issue in absurdity, for in such sentience no "things" can appear, and there things can have no "nature." Such attempts we cannot take seriously without succumbing to the most unmitigated solipsism, the solipsism of a single stroke of sentience of a solitary sentient being. The escape from that solipsism by extravagant hypotheses, such as the mind of God or an *élan vital*, is cut off by the initial postulate that the nature of anything not reducible to sentience is unmeaning; the mind of God, or the *élan vital*, or anything else not revealed in intuition or sensation, can hardly be verified by immediate experience. And if we may believe anything on the basis of hypothetical construction, why not in the nature

of things as framed by the particular sciences and the divergent types of metaphysics? The appeal to intuition or sensation is thus quite ineffectual—if the appeal is to *nothing but* intuition or sensation, its unique deliverance cannot be transcended; and if the appeal is to *interpreted* intuition or sensation, immediacy becomes hopelessly jeopardized, for interpretation is certainly no business of sentience. The wet blanket of hypothetical construction spoils the alleged purity of direct experience. Transitive cognition, which is knowledge by interpretation, must be invoked to doff the strait-jacket of immediacy. Mind is not a sensorium, it is essentially cognitive. For “sense,” as Mr. S. Alexander somewhere says, “has no monopoly of reality. We reach reality by all our powers.” What is here said of sense likewise applies to intuition as the fulcrum of the reality of time. The search in our ineffable experience for the key to the temporal nature of things illustrates a pathetic inversion, the plight of every form of subjectivism. If to approach time in this manner is called taking it seriously, then seriousness here obviously has an esoteric meaning.

We must invert the subjectivist’s inversion by reverting to the consideration of time as adjectival to things and events. This consideration alone makes possible a serious view of time, for it withdraws time from the bog of intuitive awareness. This means reinstating as valid the analytic procedure. Analysis, of course, does not work in the void, it needs “something” upon which to operate. That something I call a preanalytic situation. Now, “pure” time, as I have shown, is not given preanalytically. It is no datum of intuition, the intuited specious present, if intuited, is truly specious; “pure” perchance it is, but its temporality, if temporal, cannot exceed the limits of an instantaneous duration. Nor is the conjunct present a datum of experience. It is an abstract conception capable of analysis, if first abstracted from that which is temporal and then substantivized into an independent logical entity. The conjunct present is a good example of a postanalytic conception masquerading as a preanalytic datum. We may indeed analyze a product of abstraction. The trouble does not lie in the analysis but in the abstraction. The conjunct present, as we have seen, offers no resistance to analysis; what is baffling about it is its conception as a substantival duration spread. It is made specious by the as-

sumption that time can be considered by itself. The true preanalytic situation is the context of things and events to which time is adjectival. We may avoid some of the anomalies inherent in time if we regard it as *a part* of such a context and nothing *apart* from it.

The preanalytic situation being the context of things and events, analysis may proceed to distinguish what in that context is to be called temporal. By the temporality of things and events I understand nothing more than the flux of their existence. But the flux of their existence must not be spoken of as a flux *in* time, as if it required a prior medium through which to flow. To speak of flux *in* time is to speak in riddles. For what is this medium which the flux is said to need? Is it a static field in which the flux is deployed or is it itself incessantly flowing? If the former, time becomes indistinguishable from space; if the latter, time must be conceived as flowing in another medium prior to it, and that medium in still another, and so on *ad infinitum*. "Flux in time" is an expression either absurd or redundant, time is nothing else than the flux of existent things and events. Their flux is all the time there is.

The identity of time with the flux of things and events enables us to deal with certain distinctions impossible to maintain in terms of pure time. One distinction is presentness. The primary meaning of presentness I find in the persistence of a thing or event. If a thing or an event exists it must persist. The length of its persistence will vary in accordance with its specific nature and with such standards as may be devised for measuring it. An earthquake, as measured by the clock, will persist so many seconds or so many minutes, an economic depression, as measured by the calendar, will persist so many years or so many decades. But clocks, calendars, and the like, do not measure pure time; methods of measurement, as I shall show later, presuppose so-called isochronous events; and these, or the processes based upon them, furnish metric standards for the periodicity of other events. There can be no measurement of events unless there are events to be measured. And there can be no measurement of them except in relation to certain other events. Annihilate events, and nothing remains either to be measured or to serve as measurer. This is a truism often ignored or neglected. But events, whether they are objects or models of mensuration, must first persist. To deny them persistence is to rob them of the

property in virtue of which they enjoy existence. And their persistence cannot be reduced to one merely felt. To view their persistence as coinciding with the intuited specious present is to reason in a circle. For a feeling or sentience of persistence must itself persist, not in another feeling or sentience, but in the flux of events, if existence rather than nonexistence should pertain to it. The presentness of an existence is its persistence, whatever exists, and however we measure it. And this presentness is real and not specious, since persistence is the only property by which an existent can manifest itself as such.

The nature of anything existent is to persist at some juncture in the flux, and the flux flows from something persistent to something else that persists. If to exist is to persist, persistence serves also as a foundation for the distinction between pastness and futurity. For unless a thing or event enjoyed the *property* of persistence it could not be called truly past in *relation* to what in the flux of existence has become persistent; and if nothing is destined to persist it cannot be called truly future. What is past has actually persisted, and what is future will actually persist. Existence is a flux, and in that flux succession is essential, but the succession is a succession of things and events. A thing or event succeeded by another does not cease to be the thing or event that it is; it retains all its characters except one, namely, the persistence it rejoiced in.

The notion of a nonpresent existent, nonpresence signifying persistence either lost or not gained, involves the distinction between persistence as a property and persistence as a relation. As a property, persistence must be exemplified by anything meriting the appellation of thing or event; otherwise, nothing in the flux could be identified, taken note of, or described. A flux presupposes particular concretions *from* which and *toward* which it flows, without them, the flux would be sheer flux, flux from nothing to nothing, a conception dissolving into nonsense. Change *within* and *between* objects possessing relative constancy—this is all the word flux should connote, the degree of constancy and the rate of change being quite elastic, depending upon the specificity of the objects and the metric methods that we have the wits to perfect. Although change and constancy are correlative terms, logical priority must

be assigned to constancy if change is to have a seat, focus, and direction. Nothing but the persistent can *be* in flux, just as only the living can die. But, as the analogy suggests, the quality of persistence is transitory, in the sense that the flux of existence sustains it distributively, the persistence of one thing being abandoned for that of another. Yet, if the quality of persistence can be lost or gained, by that very token it serves to establish the connection in the succession of things and events. For an existent cannot be spoken of as having lost the property of persistence except in relation to an existent which has gained it. No existent (whether we think of it as irrevocable or as prospective) can, of course, surrender that property absolutely, since it is the nature of any existent *qua* existent to persist; an existent forfeits but relatively the quality of persistence, that is, in relation to an existent through which the flux is still passing. This is what we mean when in conventional language we speak of the past and the future as relative to the present. Persistence is an inalienable quality of all things and events, but it is a quality which in their flux they transmit to each other, so that the quality transmitted marks also the relation between them, the relation being that of successive transmission of the same absolute property. Persistence is thus a term both absolute and relative. Presentness being synonymous with persistence, any existent must be present in itself to be the existent that it is; and any existent may be said to relinquish or to acquire presentness, thus becoming past or future, in relation to an existent that actually continues to persist.

If we view the flux of existence as one in which things and events transmit to each other the absolute quality of persistence, thus fixing the relation between them as temporally successive, may we not also by the same sort of analysis reach the notion of temporal continuity? This is a more difficult matter, because "continuity" is an ambiguous term, and because considerations other than "temporal" must be invoked to justify the assertion that the flux of existence is continuous.

As for continuity, the idea of unbrokenness or uninterruptedness is usually considered to constitute its original meaning. Whatever presents no gaps, has nothing between, hangs together, such as a line in space or the flow of a river, is commonly spoken of as

continuous. But one thing is an unbroken series, another an uninterrupted process. While both are continuous, one refers to space and numbers, the other to change and action. One is static, the other dynamic. And I am not sure of their identity. Serial continuity, whether confused with infinite divisibility or interpreted as a "type of order," may be treated without regard to time; active continuity, implying a process that runs on and is kept up, is something essentially temporal. A serial continuity and a linear continuum are synonymous notions, but active continuity cannot simply be reduced to a linear continuum without darkening counsel. When I say that a certain government continues in power, the continuity involved does not suggest a continuum in the mathematical sense. What I have in mind is a continuance in action rather than a continuum of an ordered numerical series. The distinction and the relation between "continuum" and "continuance," both connoted by the term "continuity," are topics with which any theory of time has to cope. *Prima facie*, there is no necessity for regarding the continuity of time as constituting a continuum. Only as pure or as substantival does time lend itself to the notion of a continuum. Conceive of time as of one dimension, and conceive of it as composed of parts which are instants. Then time will correspond to a line, and an instant will correspond to a point. And the whole of time will constitute a continuous series. But the assimilation of time to a continuum, logically impeccable, presupposes the assumption that time can be considered by itself, an assumption shown to be fallacious. The view of time as adjectival to things and events does not countenance a close analogy with space. There is no time apart from the flux of existence, that flux is no line, and the things and events deployed there are not points. The flux is a process, and if it has continuity, in the sense of being uninterrupted, its continuity suggests continuance, something that never stops, rather than a continuum, something borrowed from a theory of assemblages. It would be well to avoid the ambiguous term "continuity" altogether and speak instead either of "continuum" or of "continuance"; we should then be able to indicate with precision the temporal characteristics of things and events in distinction from properties other than temporal. "Continuity," however, is a word too well established to be proscribed in this cavalier fashion.

That things and events are more than successively persistent, that they exemplify in the uninterrupted flux of existence structure and togetherness, depends upon characters and relations possessed by them in addition to those that we call temporal. They have also spatial features, and when these are taken account of, the order of succession must be supplemented by the order of juxtaposition. The possibility of considering existents with respect to their spatial juxtaposition enables us to regard them as persisting in a more stable manner than temporal successiveness can allow. Perhaps, as some philosophers have held, continuity (even when taken as continuance) cannot be assigned to existents apart from their spatial characteristics, and if their temporal characteristics were the only fundamental ones, existents would have to be conceived without bonds of connection. This simply shows that, even as adjectival to things and events, temporality is an abstraction, persistence merely temporal is transitory, and as such it is a property of discrete existents. The flux in which they successively exchange this property is perchance unbroken and hence continual, but the objects themselves, successively losing and gaining it, cannot be thought of as continuous in isolation from properties that are nontemporal.

But even the spatial features of existents cannot provide for their continuity, that is, for their *dynamic* consecutiveness. How could mere external juxtaposition save a succession of objects from remaining internally separate and discrete? Such juxtaposition may answer as basis for their *serial* continuity, but not for their *active* continuity. It may give us a continuum, but not continuance. For objects to continue, so that what has lost persistence is dynamically connected with what has gained it, appeal must be made to causal factors. It is causation which furnishes the relation we seek. Causative action, properly interpreted, guarantees that, in yielding up its transitory persistence, an existent transmits therewith the conditions for what is to take its place in the flux. Without the assumption of causative action, the persistence of each existent would have to be conceived of as absolute, without source or result. Each existent would have to be thought of as making an entirely fresh start, resembling in this respect each specious moment in pure time. The conception of pure time, composed of

succeeding moments or 'instants', while capable of being adapted to the demands of serial continuity or a mathematical continuum, is wholly incompatible with active continuity or continuance of process. In pure time there can be no particularity and no transition; pure moments or instants have to be viewed as homogeneous and unvarying. But the flux of existence is a flux of things and events, particular and changing in their nature; their persistence, therefore, cannot be described as merely durational, as consisting in the occupancy of specious temporal units. How imprison such a flux in a mathematical continuum? Continuity here is continuance, dynamic linkage of objects with one another, in virtue of which each comes from something different and discharges itself into something else. Nothing but causative action, though it is a tremendous postulate, can render continuous the temporal succession of things and events. To temporal continuity I am unable to attach any meaning unless I postulate causation by which successive existences may be carried backward to their sources and forward to their results. I can speak of an object as persisting only if the conditions of its persistence persist with it—namely, those required for its production and those impelling it toward eventual effects. Each thing, then, while persisting, is in communion (if we grant the postulate of causation) with both its past and its future; with the former by retaining vestiges of its genesis, and with the latter by its pregnancy of things to come.

"Temporal continuity" is accordingly only another name for causation, if what is said to continue is not specious moments in a supposititious time series, but things and events in an uninterrupted flux of existence. This reverses the argument for temporal continuity on the basis of memory and expectation. For memory and expectation, though undeniably performing cognitive functions, must be interpreted in a nonsubjectivist manner as falling within the causal scheme. To remember the past, for example, is impossible; the phrase is an ellipsis for recalling *something* that once was present. However we explain the cognitive rôle of memory, we cannot dispense with the assumption that what once persisted in its own right is connected through causative action with the "image" of it now persisting. Without causative action, the past object recalled and the present image reproducing it would

be discrete and unrelated entities. The causal factors required for the relation between the two are undoubtedly very complex, but unless one is taken as the cause of the other, we simply have succession but no continuity. And as for expectation, what is it but an inference from something now persisting to certain eventual results or effects? Such an inference we should not feel justified in making if we did not assume the operation of causative action. Here, again, the continuity between the present and the future is a causal one. We speak elliptically when we say that we anticipate the future. We do nothing of the kind. What we anticipate is something capable of acquiring persistence such as may be causally inferred from something that now persists. Not memory and expectation, but the causal conditions which they entail, furnish the foundation for temporal continuity. It is idle, therefore, to set them up, after the manner of subjectivists, as independent agencies by which the successive becomes continuous. Temporal continuity does not depend upon memory and expectation; our ability to use either for transitive knowledge presupposes causative action to which successive things and events owe whatever continuity they chance to possess.

Without causative action, no temporal continuity; and without flux of existence, no temporal succession. "The flux of existence," though a synonym for "time," is of course more than a phrase inspired by love of circumlocution. It is a conception which avoids the Scylla of intuition and the Charybdis of hypostasis. For as flux of existence, time can be conceived neither as a pure duration amenable to immediate experience nor as an independent medium subject to formal analysis. There is no better image for time than the image of a flowing river. Existence and time are coeval precisely as the water of a river is coeval with its flow. It is nonsense to raise here the question of temporal priority. But logical priority may well be assigned to one of the terms. Existence is logically prior to time because temporality is one of its characters. It is nothing in its own right, being a characterizing feature rather than a characterizable object. Does it make sense to speak of the flow of a waterless river? Time's ceaseless course, as the saying goes, apart from successive existences, is a sort of Irish bull. A flux without anything flowing—this is pure time. Is it any wonder

that its units turn out to be either an infinite number of discrete points or a perpetual succession of specious presents?

The presentness enjoyed by things and events is thus identical neither with a punctiform instant reached by mathematical analysis nor with a specious moment vouchsafed to intuitive awareness, it is an ontological character in virtue of which they are existences. For this reason I venture to call it nonspecious. In the light of the considerations already adumbrated, some further remarks are in order in defense of the nonspeciousness of the present.

Presentness I take to be persistence. Whatever persists is present in a nonspecious manner; for by the property of persistence alone can existence be distinguished from nonexistence. To be, I repeat, is to persist. But persist how, when, where, for how long? Questions such as these are relevant (1) if what persists is amenable to description, and (2) if something persists to be described. How describe the persistent? How date its coming and going? How measure the span of its continuance? Whatever schema we employ, it is well to remember, is borrowed from the flow of so-called isochronous existences. The expedient of choosing as rate measurer an isochronous process, such as pulse beats or the swings of the pendulum or the rotation of the earth on its axis, is certainly of enormous importance in formulating some law of periodicity, and no one will dispute its scientific and practical value. But any isochronism, if it is to perform its office as rate measurer, is not a sheer or pure process; it is a flux of things and events in which to exist means to persist. Each successive beat or swing or rotation is the beat or swing or rotation of *something*; the periodic process during which that something persists, be it a pulsating body, an oscillating pendulum, a gyrating earth, is the conventional standard for measuring the persistence of things and events. And clocks and calendars, which are artificial devices modeled after some natural flux in which an existent periodically gains and loses its persistence, serve not only to measure but also to date the persistence of everything else. By such devices we assign to everything a definite length and a definite sequence. It is only with reference to a clock or a calendar that we can judge a thing or event to persist a second or a year, preceding or succeeding another thing or event. But however we measure or date the persistence of anything, two

points must be borne in mind. In the first place, what we measure and date is always the persistence of something. And in the second place, its rate measurement and date determination depend upon the choice of some natural process of successively persistent existences. The nonspecious present is a period during which something enjoys persistence, it cannot be measured and dated with reference to itself, but only with reference to some law of periodicity which the isochronous persistence of some existences enables us to formulate.

With respect to our interest in measuring or dating it, there can be no objection to the definition of the nonspecious present as a period during which something persists. But this definition, emphasizing as it does the periodicity of the persistent, is essentially quantitative. With the aid of calendars and clocks, based as they are upon the isochronism of a standard class of persistent things and events, we succeed in stating *when* anything persists, and *how long*. By consulting our conventional schemes, it is possible to assign to the rate of its persistence a definite magnitude, and to express its date by a certain number. But quantity is not quality. Persistence is a temporal character of existence; like any other of its characters, persistence may be represented by a number, but cannot be reduced to a number. The possibility of reducing qualities to quantities is chimerical; after all, *what* we represent by a number is always distinguishable from the number that represents it. An earthquake, for example, may surely be the object of a quantitative judgment. By referring to calendar and clock we may tell when it started, when it ceased, and how long it lasted. But the quality of persistence, to which it owes its status of a real event, is not itself so many swings of the pendulum or so many ordinal numbers supplied by a scheme marking planetary gyrations. A tremor must first persist to be measured and dated. The same holds of any other thing or event. The nonspecious present is thus not simply a period during which something persists; the term "period" is a metrical substitute for a temporal quality which any existent must exemplify to be the existent that it is.

That persistence is a temporal quality which, for scientific and practical purposes, may be represented by a numbered length and date, is borne out by the variation in periodicity on the part of

different things and events that are said to persist. I have spoken of the persistence of an earthquake. It is a matter of empirical observation that the persistences of different tremors differ in "length"; each one has its own temporal quality of presentness or persistence as indicated by the conventional scale of numbering it. The quality of presentness or persistence is not isochronous in all things; isochronous is the quality in special classes of existences. There is no impropriety in speaking of a love affair as persisting through many "moons." The persistence, in this illustration, is an undivided quality; what we count is the number of "moons" with which the presentness of a particular amorous attachment may be correlated (each "moon," of course, having its own quality of persistence). Each thing has the presentness that it has in accordance with its specific nature; why the persistence of one thing is longer or shorter than the persistence of another, longer or shorter in relation to some metric standard, is a question which can be answered only in terms of causative action. But recourse to causative action means transcendence of mere persistence; the presentness of a thing becomes then continuous with its pastness and its futurity, that is, with something else which is its source and with something different which is its result. Appeal to causative action is inevitable. For this principle, which accounts for the continuity of different things and events successively gaining and losing persistence in the flux of existence, accounts also for the particular kind of persistence which each thing or event claims as its own.

The nonspecious present is thus an elastic concept, depending upon the specificity of each thing and event. The periodicity of presentness, as computed by any schema, is not absolute, as measured by the swings of a pendulum or the gyrations of the earth or in any other way, the persistence of one existent will have one numerical value, that of another another. But each existent, if it persists, will be a *present* existent, however long or short its periodicity. It is this elasticity in the periodicity, relative to different and specific existences, which enables us to speak of the present as nonspecious, for its periodicity, subject to numerical description, is determined, not in relation to felt moments or ideal instants, but with reference to a chosen class of isochronous things and events,

things and events that must persist after their own fashion in their very isochronism.

Elastic periodicity, however, is not the only ground for endowing the present with nonspeciousness. We must never forget that the quality of persistence is inherited and transmitted. Its nonspeciousness rests ultimately on the principle of causative action. Without that principle, gain and loss of persistence would have to be conceived of as a perpetual miracle. An existent does not simply gain or lose its presentness; it gains it *from* something else and it loses it *to* something different. In other words, the persistence of a thing has its origin and consummation in other things. An existent is present in a nonspecious manner because the persistence it enjoys in its own right presupposes existents from which that quality is derived and to which it is handed over.

The view that the nonspecious present is equivalent to persistence—persistence being a quality of unequal periodicity, involving causative action as ground for its uneven distribution as well as for its continual passage from one existent to another—is a view that would seem to lend some countenance to the common assumption that the present alone is real. How absurd is the assumption on any other view! If the present is specious, a perishing “now,” the *minimum sensible* of duration, the supposition that it alone is real turns into nonsense as soon as we ask how anything can find lodgment there, and how one specious present can ever succeed another or be continuous with it. The specious present is a strange fiction; we cannot make it the burden of reality without espousing the most fantastic kind of solipsism, the solipsism of a single flash of intuitive awareness. And if the present is an instant reached by abstract analysis, the thinnest boundary line between a preceding and a succeeding instant, what a weird thing to call real! What could possibly occur at such a boundary line? If the present is nothing but a line of division between past and future, the real is always before and after, but never here and now. But the past, when present, was it not just such a “line”? And the future also is destined for the rôle of “boundary.” All time thus vanishes into a series of “cuts,” each and all a sort of “no man’s land,” an object of delight to some logicians, but an object of bathos to those who take seriously the temporal nature of things.

By the present, then, we cannot mean either the specious moment of intuition or the spurious instant of analysis, when we make the assertion that the present alone is real. If we make the assertion at all, what we have in mind is the persistence of things in the flux of existence. But persistence, unless viewed as hereditary and pregnant, is indeed nothing but an occult quality. Without causative action, determining and directing the flux, the persistence of existents could not vary in periodicity, nor could the distinction between earlier and later persistence have any objective foundation, nor could any continuity obtain between the persistence of one existent and that of another. Denial of causative activity entails denial of all temporal distinctions and relations, and the denial of these distinctions and relations involves denial of things and events *qua* existent. The present is indeed the real, but the present as synonymous with persistence, a quality pertaining to each successive existent, and a relation securing continuance in each existent of its causes and effects.

But presentness may serve as criterion of reality in two senses. One is distributive and the other collective. Taken distributively, each particular thing or event is real, not as it did persist or as it will persist, but as it *does* persist, in its own specific way, at its own rate, and in abstraction from its substantial roots and causal changes. These are the discrete and transitory objects of common sense, they are the preanalytic data from which all scientific description and philosophic interpretation must issue forth. They are indeed given, but given as problems, soliciting inquiry and inducing hypotheses. From these preanalytic data we all *depart*, in the significantly double sense in which the verb may be employed; we all *start* from them but we all *stray* from them. We must all begin with the same data—the objects of common sense—but we do not all end with the same hypothetical interpretation of them. One mode of deviating from our preanalytic data is to reduce their presentness to simple units, such as specious moments or abstract instants. That way lies, I will not say madness, but certainly much mystification. The other mode of swerving from our preanalytic data is to incorporate into their presentness what they owe to their substantial underpinning and causal conditions. The presentness of each thing thus ceases to be its own affair, through its persist-

ence we have the continuance of its substance, its history, and its destiny. This is the collective view of presentness. The implications of the collective view enable us to pass to the conception of a present world in which coactual with the actual are the existents that are irrevocable and those that are eventual. But the collective account of presentness, of which alternative versions are possible, must ultimately invoke the notions of substance and causation.

The task of this essay has not been to formulate a complete theory of time. A complete theory of time is impossible without a sweeping metaphysical system. I have merely attempted to make clear to myself, in simple language, and without much help from "authorities," what I understand by the crucial and pivotal term of presentness, a term on which hinges the meaning of temporal succession and temporal continuity ascribed or imputed to things and events. Of one conclusion I am sure—namely, that in some sense the present must be purged of speciousness. For the speciousness of the present condemns to like speciousness all temporal sequence and all temporal order. If my way of saving the present from speciousness sounds like a voluble avowal of nescience, let those throw the first stone at me who think Saint Augustine's famous confession about time both ignominious and retractable.

McTAGGART'S ANALYSIS OF TIME

BY

PAUL MARHENKE

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McTAGGART BELONGS to that group of philosophers who believe that time is unreal. The argument by which he defended this view was published for the first time in 1908. It appeared for the second time in 1927 in a work which was published posthumously. But since McTaggart had himself intended to publish this work, it appears that he held the view and believed in the validity of the argument in its favor at the time of his death and that he presumably never wavered during an interval of almost twenty years in his allegiance to both the view and the argument. I think this is a remarkable record. It is not infrequently that we find philosophers holding the same views throughout the duration of their philosophical competence, but we rarely hear these views defended by the same arguments throughout that interval. A philosopher's faith in the validity of an argument that is intended to establish a doctrine that does violence to the persistent and ineradicable beliefs of other philosophers is usually shaken, in the course of years, and the original argument is modified or replaced by one that is more cogent. Such modifications or replacements are common even when the philosopher's views are not made the object of critical analysis. The argument for the unreality of time must therefore have appeared to McTaggart as very redoubtable, since he was willing, after an interval of almost twenty years, to support the thesis that time is unreal by an argument which is not only essentially, but for the greater part literally, the same as at its original publication.

Now, McTaggart was one of the most subtle and clear-headed of modern philosophers. If therefore an argument for the unreality of time appeared to him to be redoubtable it is at least entitled to a refutation. But an examination of the argument will do something more than disclose its invalidity; we shall not be left with the bare conclusion that McTaggart has not succeeded in demonstrat-

ing the unreality of time. For, unlike the usual demonstrations of time's unreality, McTaggart's argument depends on propositions which we should all unhesitatingly accept, unless we knew in advance that their consequence is the unreality of time. McTaggart's argument, we shall find, would be valid, if only certain meaningless propositions were significant. But since these propositions involve a confusion of types they do not appear to be meaningless on first view. Their nonsignificance becomes apparent only after an analysis of the concepts involved in these propositions. In short, an examination of the argument will be useful in showing us how to be clear about time, and what pitfalls to avoid in its analysis.

McTaggart asserts that time is unreal on the ground that time is a self-contradictory concept. The contradiction makes itself manifest when we analyze the meaning we attach to this concept. Such an analysis yields a set of propositions which together state what we mean by time. According to McTaggart, these propositions are incompatible, and the concept of time must therefore be self-contradictory and time cannot be real. I shall now proceed with the detailed exposition of this argument.

Time is conceived as a continuous series of moments, unbounded in either direction, if we assume that there is neither a first moment nor a last one. The terms of this series are ordered by an asymmetrical transitive relation. As the ordering relation we can take either the relation "earlier than" or the relation "later than." If x and y are moments, and x is earlier than y , then y is not earlier than x . Also, if x is earlier than y and y earlier than z , x is earlier than z . It is because of this serial character of its moments that time can be represented by a directed straight line. Similarly, the events in time can be arranged as a one-dimensional series, running from earlier to later. We naturally think of the history of the world or of the universe up to the present as forming such a series. Thus, the events which constitute the reading of this paper can be arranged serially in this manner. The earlier events were superseded by later events, and these by events that are taking place now. But the events that are taking place now are in turn superseded by other events, by events that are future as yet. In this manner we extend this serial ordering of events through the present into the future.

The series of temporal positions which runs from earlier to later or conversely, McTaggart calls the *B* series. The events that happen at these positions therefore also form such a series. Every event that ever has happened, ever does happen, or ever will happen is a member of a *B* series. Every event, whether it is past, present, or future, is earlier than some other event and later than some other event. The election of Franklin D. Roosevelt, for example, is earlier than the election of the thirty-third President of the United States and later than the election of Hoover.

The fact that the moments of time form a *B* series is one of its essential characteristics. But every moment is not only earlier than and later than some other moment. It is also either past, present, or future. Thus, the moments of time fall into a second serial order, distinct from the first, which McTaggart designates as the *A* series. The *A* series is "the series of positions which runs from the far past through the near past to the present, and then from the present through the near future to the far future."* Similarly, the events in time form such a series. We think of events as receding from the present into more and more remote regions of the past and as proceeding similarly into more and more remote regions of the future.

The *A* series is the stage on which McTaggart's time commits suicide. But before we shall witness this final dissolution we must examine the proof that the *A* series is essential to time. This proof depends upon the proposition that time involves change. If, then, change were possible without the determination of events as past, present, or future—that is, without the determinations of the *A* series—the fortunes of time would be divorced from the fortunes of this series. McTaggart therefore proposes to show that time cannot exist unless these determinations are intrinsic characteristics of events.

If events are ordered as a *B* series and not also as an *A* series, there can be no change. We might retort that the *B* series is not incompatible with the possibility of change. Change, we might say, consists in the fact that an event *M* in the *B* series ceases to exist while another event *N* begins to exist. But this explanation is easily refuted. "If *N* is earlier than *O* and later than *M* it will

* McTaggart, *The Nature of Existence*, II 10.

always be and has always been earlier than *O* and later than *M*. *N* has always been an event, and always will be one, and can not begin or cease to be an event."* The serial ordering of events in the *B* series is a permanent ordering. The event of Roosevelt's election to the presidency is later than the event of Hoover's election to the office and earlier than that of his successor's whoever he may be. The event of Hoover's election does not cease to be nor does that of Roosevelt's successor's election begin to be in that series. In short, the characteristics of events in the *B* series do not change.

Although we have found that events do not change in the *B* series, this series may perhaps be compatible with the change of substances. If so, the distinctions of the *A* series may be omitted from our account of time. Russell at one time held that past, present, and future are not intrinsic characteristics of time, but belong to time only in relation to a knowing subject. The serial arrangement of the moments of time according to the relation of earlier and later, however, is an intrinsic property of time. According to Russell, therefore, time is a *B* series, but not an *A* series. Such a series is compatible with the change of substances. "Change is the difference, in respect of truth and falsehood, between a proposition concerning an entity and the time *T*, and a proposition concerning the same entity and the time *T'*, provided that these propositions differ only by the fact that *T* occurs in the one where *T'* occurs in the other."† For example, there is change if it is true that my poker is hot at time *T* and if it is false that my poker is hot at time *T'*.

But if the history of the poker is conceived as falling within a *B* series, then the poker does not change. If the poker is hot at the time *T*, then it is always true that the poker has the quality of being hot at time *T*. And if the poker is cold at the time *T'*, then it is always a quality of the poker to be cold at the time *T'*. These propositions about the poker are true at all moments. Change of substances thus presupposes change of events, and we have already seen that events do not change. We might put the argument in this way. The poker is in the state of being hot at the time *T* and in the state of being cold at the later time *T'*. The state of a sub-

* *Ibid*

† *Principles of Mathematics*, sec. 442.

stance is an event. The two events are different, but they also share a common character. The first event is a poker in the state of being hot, the second is the same poker in the state of being cold. But we have already demonstrated that events do not change their characteristics. Hence a poker which is hot cannot change to a poker which is cold. McTaggart concludes that there can be no change, unless there are propositions that are sometimes true and sometimes false. This holds with respect to propositions which make assertions about the past, present, and future, and with respect to those propositions alone.

Change is possible only if the determinations of the *A* series apply to time and to the events in time. An event that is now present was future, one which is now past was present, and an event which is now past becomes farther and farther past as present events become past and future events present. It is a common assertion that the past is unalterable. The assertion cannot be meant in an unqualified sense, for past events do change in becoming farther and farther past. Similarly, future events change in becoming less and less future and finally in becoming present. The *A* series, then, always has the same membership, but the determinations of events as past, present, and future are impermanent.

We have now demonstrated that if time is to be real, the events in time must fall into an *A* series. We shall next show that the events in time cannot form an *A* series and that therefore time cannot be real.

"Past, present, and future are incompatible determinations. Every event must be one or the other, but no event can be more than one."* If an event is present, then it is neither past nor future, and if it is future it is neither present nor past. "This exclusiveness is essential to change and therefore to time. For the only change we can get is from future to present, and from present to past. The characteristics, therefore, are incompatible. But every event has them all. If *M* is past, it has been present and future. If it is future, it will be present and past. If it is present, it has been future and will be past."†

How are we going to reconcile the proposition that these characteristics are incompatible with the proposition that every event

* *The Nature of Existence*, II. 20.

† *Ibid.*

has all of them. It will be said that this reconciliation offers no difficulty. The characteristics are incompatible only if they characterize an event simultaneously. The difficulty disappears as soon as we realize that they do so successively. An event is first future, then present, and then past. An event M has futurity at the time T , it has presentness at the later time T' , and it has pastness at the time T'' which is still later. The difficulties of the A series are therefore removed by the B series.

This explanation is obviously a vicious circle, for it assumes the B series in order to explain how the distinctions of the A series can apply to events. But the B series, independently of the distinctions of the A series, is not a temporal series at all, for the events which are ordered as a B series must also be capable of being ordered as an A series, in order to constitute a temporal succession. Hence, the A series must be presupposed in order to account for the change of an event in the A series from future to present to past.

We might try to remove the incompatibility of the three characteristics of past, present, and future in another way. "It is never true that M is present, past, and future. It is present, *will be* past, and *has been* future. Or it is past, and *has been* future and present, or again is future, and *will be* present and past."* When we say that M is present we mean that M has the characteristic of presentness *now*, that is, at a moment of present time. When we say that M will be past we mean that M has the characteristic of pastness at a moment of future time. And when we say that M has been future we mean that M has the characteristic of futurity at a moment of past time. We are thus constructing a second A series whose members are the events characterized by the determinations of the first A series. But every moment of the second A series has each one of the incompatible determinations of past, present, and future. The only way of making consistent the change of moments in this series from future through present to past is to say that every moment has each of these determinations with respect to different moments of a third A series. The contradiction is therefore irremovable. "You can never get rid of the contradiction, for by the act of removing it from what is to be explained,

* *Ibid.*, p. 21

you produce it over again in the explanat^on. And so the explanation is invalid ”*

We can state the paradox of the *A* series most simply as follows. Events change with respect to the characteristics past, present, and future. All change is temporal change. Therefore, the change of events with respect to these temporal characteristics must itself be temporal. If the time in which events change with respect to these determinations is the time to which the initial determinations of past, present, and future apply, then the explanation is a vicious circle. If it is different, then the time in which temporal change of events from future, through present, to past occurs is subject to the same difficulty as the *A* series with which we began. For this time must be an *A* series, since the *A* series is essential to time, and the explanation loses itself in an infinite regress.

It is my opinion that there is no formal mistake in this argument. Moreover, the premisses from which the conclusion that time is unreal is derived are true. Everyone, I think, will admit that the events in time form both an *A* and a *B* series. Nevertheless, I think that the conclusion is in error and that time is real. But we have already admitted that the premisses are true and that there is no formal fallacy in the reasoning. How then can we reject the conclusion while accepting the premisses? We shall find the answer to this question when we consider the result of the analysis of McTaggart's interpretation of the premisses. On McTaggart's interpretation, assuming the interpretation to be significant, the conclusion follows. But then, his interpretation of these propositions does not express what we mean by time. If these propositions are to express the nature of time, they must be given a sense different from that assigned to them by McTaggart. I propose therefore, first, to determine the meaning which these propositions must have if they are to be propositions about time, and secondly, to determine the meaning which is needed if they are to yield the conclusion that time is unreal.

Since the argument makes considerable use of the term "event," I shall begin with the clarification of this concept. Ordinary discourse applies this concept to occurrences so short that we can be aware of them as a whole, such as a flash of lightning, an automo-

* McTaggart, "The Unreality of Time," *Mind*, n.s., XVII:457.

bile accident, the blowing of a tire, a sneeze. The ticking of a clock, on the contrary, ordinary discourse regards as a series of events, and never as a single event. Mr. Broad argues that this usage of the term "event" has nothing to recommend it. If the several members of a succession of events are all qualitatively similar, as may be illustrated, for example, by the successive phases in the history of a thing, then the only relevant difference between what common sense would regard as a single event and the whole series of events is a temporal difference. The former lasts but for a short time, whereas the latter lasts for a long time. But this difference is merely quantitative and does not justify us in calling the one bit of history an event, while refusing this term to a collection of such bits of history. Accordingly, Mr. Broad defines an event as "anything that endures at all, no matter how long it lasts or whether it be qualitatively alike or qualitatively different at adjacent stages in its history."^{*} Mr. Broad is therefore arguing that common sense restricts the application of the term "event" arbitrarily to events of short duration, and that this restriction is not justified. The term "event" signifies an occurrence, and the battle of the Somme, which "occurred" over many months, is therefore an event in exactly the same sense as any incident in that battle to which common sense insists on limiting the application of the term.

I think this argument is as mistaken as any argument can be. Common usage refuses to regard the battle of the Somme as one single event, for the same reason that it refuses to regard half a dozen oranges as one big orange. An event is a happening or occurrence, and happenings or occurrences are transitory existents. An event therefore exists when it happens, it does not continue to exist after it has happened. Yet Mr. Broad's definition of an event has exactly this implication, that an event continues to exist after it has happened. If the battle of the Somme is to count as one event, then the earlier events that make up that battle continue to exist after they have occurred. Mr. Broad cannot be accused of being inconsequential in this matter, for he draws exactly that conclusion. "There is no such thing as *ceasing* to exist, what has become exists henceforth forever. When we say that something has ceased to *exist* we only mean that it has ceased to be *present*."[†]

^{*} Broad, *Scientific Thought*, p. 54.

[†] *Ibid.*, p. 69.

Unfortunately, this conclusion leads to a further consequence which is self-contradictory. If an event continues to exist after it has ceased to be present, then it must continue to occur at all moments which are later than the moment or moments at which it first became a member of the existent. Mr. Broad conceives of the growth of history on the analogy of the growth of a sausage in the hands of the sausage maker. As the sausage filling is squeezed into the opening of the casing, the filling already squeezed in is pushed farther and farther back. A handful of the filling corresponds to an event that has just become. The displacement of an individual handful of sausage filling already in the casing by a successor at the opening of the casing corresponds to the displacement of an event by a successor as a new event comes into being. The fact that an individual handful of the filling does not impair the reality of the handfuls that have already entered the casing, but merely alters their spatial position, corresponds to the theory that the new events that become do no damage to the reality of the events that have already become, but merely alter their temporal position. Finally, to the fact that a dozen handfuls of sausage filling constitute a single large portion of filling after the handfuls have become united in the casing, there corresponds the theory that any number of events, that come into being successively, together constitute one long event.

Although an event is a transitory existent it is undoubtedly not a momentary occurrence. But if events are durational we are at once faced with the necessity of specifying the maximum length of the duration within which an event must fall. Can we satisfy this requirement? The answer to this question is usually found in the conception of the specious present. An event must fall within the temporal span of a specious present. A succession of occurrences longer than this temporal span cannot constitute one event; for the members of the succession that fall beyond the limits of this span are past, and therefore no longer existent. But can this answer be accepted? The assertion that an event must fall within the temporal span of a specious present raises at once the question of the possibility of beings or organisms whose specious presents differ in temporal span. The battle of the Somme is a series of events for us, since this battle cannot fall within the specious pres-

ent of a human being, but it might very well fall within the specious present of an imaginary being which was capable of apprehending in one temporal span what is for us a whole series of events

Once we admit the possibility of different specious presents—different, that is, in respect of their magnitude of duration—we are confronted by the following alternatives. Either perception is veridical and then not every observer can be correct in his determination of what constitutes one event, or perception is not veridical and then the determination of what is to count as one event and what as several becomes relative to the specious present of the observer.

Consider the first alternative. Let us assume that there are three beings *A*, *B*, and *C* whose specious presents increase in magnitude in the order *A*, *B*, *C*. Let us also assume that there is an event *E* which falls within the specious present of *C*, but not within that of *B* nor, *a fortiori*, of *A*'s. Only a part *E'* of this event falls within the specious present of *B*, and a still smaller part *E''* falls within that of *A*. On the present assumptions there could be no being that had a specious present longer than that of *C*. For we have assumed that the event *E* is a single occurrence and that therefore observer *C* apprehends the events of nature veridically, that is, that his judgments about what exists and what exists no longer are true. Hence, anything preceding *E* has ceased to exist, and nothing that has ceased to exist can be an object for anyone's awareness. *A* and *B*, on the contrary, do not apprehend nature veridically. Observer *A*, for example, is perceptually aware only of the partial event *E''* which is overlapped by the whole event *E*. He therefore declares that those parts of the event *E* which precede *E''* are past, and this means that he declares that those parts have ceased to exist. And in this judgment he is mistaken.

We cannot, therefore, set a limit to the duration of an event by means of the conception of the specious present, for any determination of this limit based on this conception would be arbitrary. And any arbitrary solution of the problem would involve the falsehood that there could be no specious present longer than that of the observer required by the solution.

The second alternative, that the determination of what consti-

tutes a single event is relative to the specious present of an observer, is similarly objectionable, though for another reason. On this alternative the distinction between past and present is relative to an observer. All observers agree in their determination of events as future, though they do not agree in their determination of what constitutes a single future event. They disagree in their determination of events as past. An event that *A* judges to be past may still be present with respect to *B*, one that *B* calls past may still be present with respect to *C*. However, the determination of an event as past or present cannot be made independently of an observer, events have these characteristics only in relation to an observer. The judgments of these observers are therefore not incompatible. The proposition "The event *E* is present" means that the event *E* is perceived or is contemporary with an event that is or can be perceived. Similarly, the proposition "The event *E* is past" means that *E* can or could be remembered, or is contemporary with something that can or could be remembered.

Mr Broad has shown that the view which holds that past and present are characteristics which events have only in relation to an observer, involves either a vicious circle or an infinite regress. Every event that an observer knows of has both the perceptual and the memory relation to him. But these relations are incompatible; when an event is remembered it cannot be perceived, when it is perceived it cannot be remembered. We solve the difficulty by explaining that an event always has the perceptual relation to an observer before it has the memory relation to him. But this only means that the event of remembering the event is future when the event of perceiving it is present, and that the event of perceiving it is past when that of remembering it is present. The explanation therefore assumes that there are events to which the characteristics of past and present are intrinsic. In other words, it has to assume them as intrinsic in order to explain them as relative. If we attempt to avoid this conclusion by reiterating the original contention that past and present are relative to an observer, we shall have to explain what we mean by determining the event of perceiving an occurrence as past and the event of perceiving some other occurrence as present in terms of the different relations which these events have to the observer, for example, in terms of

the different relations which they have to an observer's acts of introspection. But exactly the same difficulty is encountered at this stage, we either terminate the explanation with a set of events to which the determinations of past and present are intrinsic or we are forced to continue with the relational explanation. Mr. Broad concludes that "it does not follow that past and present in *external Nature* may not be reducible to certain relations between objective events and minds which observe them, but it does follow that these characteristics cannot be analyzed away in this manner out of *Reality as a whole*, which of course includes observing minds as well as what they observe."

Let us, then, accept provisionally the conclusion that the events which are the objects of cognitive acts can be determined as past or present only in relation to an observer, but that these determinations are intrinsic to the cognitive acts themselves. Can we rest content with this conclusion? I do not think we can; we cannot hold both that the events of external nature are neither past nor present independently of their relation to an observer, and that these determinations are intrinsic to the cognitive acts of an observer. For if the cognitive acts of an observer are intrinsically either past or present, then the objects of these acts, which are contemporaneous with them, must likewise be intrinsically either past or present; the distinctions cannot be intrinsic to the one set of events without being intrinsic to the other. If so, Mr. Broad's conclusion that past and present, in respect to the events of external nature, are "reducible to certain relations between objective events and minds which observe them," must be rejected.

The doctrine that the determination of what is to constitute a single event is relative to an observer is, therefore, also untenable. But neither is this determination effected by anything intrinsic to nature. For if there were a natural limitation to the duration of an event, there would have to be a maximum specious present within which that event could be observed as a whole. And we saw no reason for assigning a maximum to the temporal spans of possible specious presents. If therefore we accept the view that past and present are intrinsic determinations of events, it seems impossible to maintain the characterization of an event as a tran-

* *Ibid.*, p. 61.

sitory occurrence. For the acceptance of this doctrine means the rejection of the view that this determination is relative to an observer. But if the determination is not relative, how are we going to determine whether we are dealing with a single event or with a succession of single events? We cannot do it by means of the assumption that a single event must fall within the specious present of an observer, for this assumption leads to contradiction as soon as we admit the possibility of specious presents of different durations. And so far no other alternative has occurred to us, by which this determination may be effected.

I think that as a matter of fact there is no other alternative, and that we must therefore reexamine the assumption that the determination of what constitutes a single event is effected by the specious present. This reexamination must of course show that the admission of the possibility of different specious presents does not lead to the contradictory results of our first examination of this assumption.

We could duplicate the different experiences of *A*, *B*, and *C* in a single observer, if we were able to increase or decrease the velocity of the normal temporal flow of events. If we increase this velocity, an observer will be able to assign the change either to the events or to himself. If he assigns it to himself, he will have to say that the velocity of the temporal flow of his apprehension has increased and that as a consequence his specious present has expanded. If he assigns it to the events, he will have to say that his specious present has not altered, but that the velocity of succession of events has been increased. Our observer will obviously be unable to determine absolutely which one of the two has changed. We can speak of a change in the velocity of succession of events only if we have a standard process with which the different velocities of succession can be compared. If we take the velocity of the flow of apprehension in our observer as the standard process, we decide that the velocity of succession of events has been increased; if we take the velocity of succession of events as the standard process, we attribute the change to the flow of apprehension in the observer, and hence we conclude that his specious present has been altered.

But when we consider the possibility of different specious pres-

ents, we are not concerned with the consequences of the assumption that the specious present of a given observer is transformed into the specious present of a different observer. We are here concerned with the problem of comparing the specious presents of different observers. A single observer with respect to whom the velocity of succession of events is increased can determine the change either as an increase in the velocity of succession of events or as an increase of his specious present. Whichever he does, he adopts a convention. If he assigns the change to the events, he takes his specious present as the standard of reference; if to the specious present, he assumes that the velocity of succession of events is a standard process. But these conventions do not enable us to compare the specious presents of different observers. In order to make this comparison we have to assume a standard that is common to the observers.

Now suppose we have three observers $B1$, $B2$, and $B3$. And suppose that these observers have determined their specious presents to be of identical duration by comparing their specious presents with the duration of some periodic process E that falls into their specious presents as a whole. If they have selected the succession of ticks of a clock as the standard process, these observers would, for example, conclude that the number of ticks that fall into one another's specious present is the same. We now transform observer $B1$ into observer A by decreasing the velocity of succession of events and we transform observer $B3$ into observer C by increasing this velocity. Observer $B2$ we may assume to be identical with the observer B . How do these observers determine that this transformation has taken place? They decide that there has been either an increase or a decrease with respect to the standard process E . Hence, the observers will be able to decide that their specious presents are still of identical duration if the number of phases of the standard process E that fall within their specious presents is unchanged. If, however, the process E be included in the transformation, the question whether their specious presents have remained the same becomes meaningless. But when we can give a meaning to the question, we have to conclude that the observers are aware of different events, however exact the correspondence between the qualities of these events may be. For E and

E' may be characterized by the same qualities and the order of succession of these qualities may be the same in both, but unless the velocity of succession of these qualities is also the same in E and E' these events cannot be identified.

We next transform observer $B1$ into observer A by decreasing his specious present and we transform observer $B3$ into observer C by increasing his specious present. How do these observers determine that their specious presents are different? When observer $B3$ is transformed into observer C in the previous example, he decides that the velocity of succession of events has been increased when he is able to conclude that his specious present has not altered. He comes to this conclusion when he finds that the number of phases of the standard process E that he can apprehend has not altered. Suppose, however, he decides that his specious present has been increased, that the velocity of succession of events has not really increased as it appears to have. If he does come to this decision he is abandoning the clock in favor of a new standard; for he is measuring the duration of his specious present no longer by the clock, but by the events he observes. He finds that the number of events that fall within the temporal span of his specious present has increased, and therefore he concludes that his specious present has increased. In other words, he has selected some periodic process $E1$ from among these events as the standard by which the duration of a specious present is to be determined. If we determine the velocity of the old standard E by means of the new standard $E1$, we find of course that this velocity has decreased. For the number of phases of the periodic process E that fall within the observer's specious present is the same as before. But these phases are now spread over a longer duration and therefore this observer will conclude that his clock has slowed down. Hence, if we assume that observers with different specious presents all observe the same events, we have to conclude that they cannot agree on the velocity of succession to be assigned to the ticks of a given clock; for the velocity they observe will depend on the duration of their specious presents. But as before, however close the qualitative similarity between events may be, and however closely they may agree with respect to the order of succession of these qualities, unless the velocity of their succession is also the same for

these events, they cannot be identical. Hence, observers with different specious presents do not have all events in common.

The observers *A*, *B*, and *C* are therefore confronted by the following alternatives. Either they assume that the periodic process *E1* is identical for all of them and therefore suitable as a measure of their specious presents, and then they cannot agree on the velocity to be assigned to the periodic process *E*, or they continue to use the periodic process *E* for making time determinations, and then they cannot agree on the durations and dates to be assigned to events, for as the specious present of an observer increases his clocks slow down. If the observers continue to use clocks in making temporal determinations, we can of course no longer give meaning to the assertion that they have different specious presents. For since a time system is determined by clocks, these observers are associated with different time systems. If, however, they use the periodic process *E1* as their clock, then they can indeed agree on the time determinations they assign to a set of events. But their time systems are nevertheless not identical. For identity of time system is determined not only by the fact that the different observers agree in the determination of the temporal relations between events, but also by the fact that no observer is aware of events not observable by the others. Since the second condition is not as a matter of fact fulfilled, we have to conclude that *A*, *B*, and *C* are associated with different time systems.

The determination of what constitutes a single event is therefore dependent on the specious present of the observer, or, alternatively, on his time system. This result appears to contradict the conclusion we drew previously that this determination cannot depend on the observer, since the determination of events as past or present by different observers must otherwise lead to incompatible assertions. But that conclusion was based on the assumption that observers with different specious presents could all be associated with the same time system, that is, that the classes of events of which these observers are aware have the same membership. Since that assumption must, however, be abandoned, the objection loses its force.

We are now ready to examine McTaggart's proof that time is unreal. Events, McTaggart tells us, form a *B* series. We have

pointed out before that this proposition appears to be plausible. But it is plausible only if understood in a certain sense. In the sense in which McTaggart understands it, and in which he needs it for the purpose of his argument, the proposition is far from plausible. The *B* series, as a series of events, he describes as a series of permanent terms with permanent relations of order between them. After what we have concluded about events, this proposition cannot be given the sense in which it implies that the *B* series exists. For the *B* series does not exist because its members do not exist, with the exception of course of the events that occur now. Events that have occurred and events that have not yet occurred are nonentities. Hence, there is no series of events, if this assertion is to be interpreted as meaning that the events that have happened, do happen, and will happen can be ordered as a series in the same way in which a group of people can be serially arranged in the order of increasing weight. When a group of people is being ordered, the ordering results in a whole, the determination of the place of any individual in the series does not annihilate the reality of his predecessor in the series. When events are being ordered the ordering does not result in a whole; events do not form a *totum simul*. The successor of any event destroys that event. When we say that time forms a *B* series we mean that the order of succession of events is permanent. But this assertion does not imply that the terms that succeed one another must also be permanent. McTaggart assumes that the order of succession cannot be permanent without the ordered terms being also permanent.

Similar remarks apply to McTaggart's conception of the *A* series. The *A* series of events is a series of permanent terms with impermanent relations between them. For the determination of events as past, present, and future is made from a changing standpoint. The *A* series is therefore conceived by McTaggart as a series whose permanent terms successively have different relations to a movable index that traverses them in a specified direction. The *A* series can accordingly be represented by a straight line to which a movable index has been fixed. As the index is moved along the line, its relations to the points or segments of the line are altered. If we specify further that the index shall move always in the same direction, we have an accurate representation of what McTaggart

means by the *A* series Points and segments to the left of the index, for example, represent past moments and past events, those to the right represent future moments and future events. But we must not make the mistake of supposing that there are entities, moments, or events, that correspond to the points or segments of the line. There is, indeed, this correspondence between points and segments and moments and events when we single out those points and segments with which the moving index is in contact. For these points and segments represent present moments and present occurrences. But when this contact has been transferred to other points and segments, the former points and segments cease to correspond to existents.

The contradiction in the *A* series is a consequence of its conception. The paradox of the *A* series is derived from the assumption that when an event becomes present after having been future, this change in the characteristics of the event is something that happens to the event, that is, is itself an event. Similarly, when an event becomes past, or becomes farther and farther past, these changes in the characteristics of the event are themselves events. In brief, McTaggart assumes that when I assert that an event is past, present, or future, I am asserting that the event is in a certain state, that is, I am asserting that something is happening to the event. The paradox of the *A* series arises therefore from a confusion of types. The propositional function " x is a constituent of an event" is significant only if the range of x be specified as the collection of things. It ceases to be significant for values of x that are events. McTaggart, however, assumes that this function remains significant under these conditions. It is therefore not surprising that he should find the *A* series paradoxical. Paradoxes that depend for their being on a confusion of type are well known to the logician. In the present matter the paradox depends on the assumption that an event is a constituent in three occurrences. The proposition "The event E is present" means, according to McTaggart, that E has the characteristic of presentness now, that is, E is in the state of being present at a moment of present time. Let us designate this state of the event E as the event $E1$. Since E is present now it must have been future, that is, E has the characteristic of futurity at a moment of past time. Let us designate this

state of the event as the event *E*2. Finally, since *E* is present now, it will be past, that is, it has the characteristic of pastness at a moment of future time. Let us designate this event as the event *E*3. Since *E* is a constituent of the three events *E*1, *E*2, and *E*3, and since it cannot be a constituent of these events at the same time on pain of contradiction, we have to give these occurrences different dates. But, obviously, the events *E*1, *E*2, and *E*3 themselves are the members of an *A* series, and the determination of events as past, present, and future is therefore applicable to them. The original difficulty about *E*, which was to the effect that *E* is a constituent of the three events, *E*1, *E*2, and *E*3, and which we removed by giving these events different dates, therefore recurs with respect to these three events. And it can therefore never be mitigated.

The way to avoid McTaggart's paradox is not to fall into it, and we shall avoid falling into it if we avoid making the initial assumption that an event can be a constituent of an event. It follows, therefore, that the propositions "*E* is future," "*E* is present," and "*E* is past" cannot be analyzed in the manner suggested by McTaggart. The suggested analysis of the proposition "*E* is future" as "There is now an event of a certain sort having the characteristic of futurity," is meaningless. And analogously the suggested analyses of the propositions "*E* is present" and "*E* is past" are also meaningless.

We shall not escape the paradox by inventing an elaborate theory of time, such as Mr. Broad has invented for the purpose of dealing with the paradox. Mr. Broad's theory of time may be summed up in the proposition "The past and the present exist, but the future does not exist." When Mr. Broad says that the past exists he professes to mean that the past exists now, and similarly, when he says that the future does not exist, he professes to mean that the future does not exist now. If these propositions were significant, then past and present, at any rate, would be characteristics with respect to which events may change; that is, the change of an event from present to past would itself be an event. McTaggart of course lost no time in pointing this out in his most recent exposition of the paradox.

Mr. Broad thinks that his view that the future is unreal entails

the consequence that propositions about the future are neither true nor false, since a proposition can be true or false only if it makes a reference to a fact on which its truth or falsity depends. But since there are no future events, propositions about the future cannot make a reference to such events. Since the past, on the contrary, is real in Mr Broad's view, propositions about the past do have a reference. If we are concerned with an affirmative proposition, its reference is either to a positive or to a negative fact. If the proposition has the first reference, it is true, if the second, it is false.

At the time at which a proposition about the future is asserted there is no fact which renders it true and there is similarly no fact which renders it false. At that time it can therefore neither be verified nor falsified, since verification and falsification require confrontation with occurrences. When the alleged difficulty is put in this way we see at once where the mistake lies. Mr Broad thinks that a judgment about the future can be true or false only if it refers to a fact, either positive or negative, which has an event as a constituent. But if it did have such a reference at the time the judgment is made, the event would have to occur before it occurs. It follows from Mr Broad's assumption, for example, that if I now venture the prediction that this paper will soon come to an end, my assertion can be said to be either true or false *now* only if there is now an event which has the characteristic of being the end of this paper and also the characteristic of futurity. Later on, this same event will have the characteristic of presentness, and still later it will have the characteristic of pastness. If therefore the proposition "The future exists now" is significant, events must change with respect to the characteristic of future, present, and past—that is, events must be constituents of events. But this consequence is meaningless and the proposition from which it was developed is therefore also meaningless. Hence its contradictory "The future does not exist now" must also be meaningless. Accordingly, Mr. Broad's view that propositions about the future are neither true nor false at the time at which they are asserted because they lack reference to events, is a consequence derived from the assumption that a nonsignificant proposition is significant.

The conclusion that the two propositions "The future exists

now" and "The future does not exist now" are both nonsignificant can at once be extended to include the corresponding propositions about the past and the present. I do not mean to suggest that these propositions are not capable of an interpretation that is significant. The first pair of propositions can be interpreted as asserting respectively that future events are identical with present events and that future events are not identical with present events. These interpretations are of course innocuous, they are either contradictions or truisms. The interpretations which I regard as nonsignificant are the interpretations that contain the phraseology "There are events which have the characteristic of futurity, or of presentness, or of pastness" or the phraseology "There are no events which have the characteristics of futurity, or of presentness, or of pastness."

The propositions "*E* existed" and "*E* will exist" cannot, therefore, have an analysis that implies that these propositions make a reference to events. But neither can they be analyzed in a way that implies that they do not have such a reference. If the first analysis is meaningless, the second is also. The propositions "*E* exists" and "*E* does not exist" alone make a reference to events, and they can therefore be verified or falsified by examining present occurrences. The propositions "*E* existed" and "*E* will exist" cannot be verified or falsified by observing present occurrences. We should therefore not expect that the form of words which we employ in the analysis of the former remains significant in the analysis of the latter. The analysis of the propositions "*E* existed" and "*E* will exist" cannot begin with the statement "There is an event"; this statement is significant only in the analysis of the proposition "*E* exists." The tense cannot be analyzed away from the propositions "*E* existed" and "*E* will exist" without falling into nonsense.

Now these propositions obviously do have a reference and they are just as obviously either true or false. Their reference is to a position in a temporal order. The order of succession of events, we recall, is a permanent order; events perish, but their order lasts forever. When the events *E*1, *E*2, and *E*3 succeed one another in the order *P*, *Q*, *R*, we shall say that *E*1 occurs at *P*, *E*2 at *Q*, and *E*3 at *R*, where the phrase "*E* occurs at *P*" means "*P* marks the

position of *E* in the order of succession of events." The proposition "*E2* is present" refers to a position *Q* in the order of succession of events, and it refers also to events, for it implies the proposition "*E2* exists." It may therefore be analyzed as follows. There is a position *Q* in the order of succession of events and *E2* occurs at *Q* and *E* exists. The proposition "*E1* existed" has the following analysis. There is a position *P* in the order of succession of events terminating with the position of *E2*, and *E1* occurs at *P*. In a similar way we analyze "*E3* will exist" as. There is a position *R* in the order of succession of events beginning with the position of *E2*, and *E3* occurs at *R*. Of course, these analyses are just stilted ways of stating that *E2* occurs at *Q*, that *E1* occurred at *P*, and that *E3* will occur at *R*. And if anyone prefers these simple statements he is welcome to them.

We can verify or falsify these propositions when we can determine whether the position in question is correlated with the kind of event described. But for that determination we do not need the event. If with respect to a proposition about the past we had made a permanent record of the fact that the event described occurs in that position, the proposition is verifiable. If we can infer from our knowledge of causal laws that the event described occurs in the position, the proposition is again verifiable. With respect to a proposition about the future we cannot, of course, appeal to the permanent record that the event described is correlated with the position in the series. For we cannot record the fact of its occurrence until this occurrence has taken place. But again, if causal laws enable us to predict the occurrence described, the proposition is again verifiable.

The assertion that the past and the future exist, or, more accurately, that the past existed and that the future will exist, simply means that present occurrences are the successors and the predecessors of occurrences. One cannot seriously doubt that the past and the future are real, although of course one cannot give a demonstration of this proposition. I cannot seriously doubt that the reading of this paper had a beginning and that it will soon have an end. If I should suddenly be overtaken by the psychosis of Gertrude Stein, we should not hear the end of this for a long, long time, if I should be stricken down suddenly, I would never

reach the last word; and if events should cease occurring suddenly, none of us would ever hear the end of this paper. I am aware of these contingencies, but I can avert them by reading the last word now.

SUCCESSION AND DURATION

BY

D. S. MACKAY

SUCCESION AND DURATION

D. S. MACKAY

Does it knock too hard at thy head if I say,
That Time is both father and son?
Tough lesson, when senses are floods over sense!—
Discern the paternal of Now
As the Then of thy present tense.
You may pull as you will either way,
You can never be other than one

Meredith *The Empty Nurse*

TIME, LIKE CAESAR'S GALLIA, is divided into three parts, and it is only through such a threefold division that we can assign a temporal position to objects. Without it, any system of measurement we may adopt is irrelevant to time. But the division of time is determined in two different ways. Events are said to be (1) in the *past*, *present*, or *future* and they are said to be (2) *earlier than*, *simultaneous with*, or *later than* one another. The former division is intrinsic to the character of events while the latter denotes an extrinsic denomination by virtue of which they are related to one another in a serial order. When we distinguish past, present, and future time, we are assigning a different temporal character to events, regardless of their relations to other events in any definite temporal order * We can refer to an event that occurred yesterday or an event that may occur tomorrow without thinking of it as either earlier or later than any other

* In saying this, I do not mean to deny that past, present, and future events are causally related, nor do I mean to suggest that there can be any course of events that is not an order of temporal succession. My meaning is that the character of pastness, presentness, or futurity, which may be discerned in any specific event, does not depend on its relations to any other events in a series. On the contrary, these serial relations depend upon its temporal character as past, present, or future.

specific event. But an event is said to be earlier or later only with reference to some other event in a temporal sequence. Thus, our experience of time includes both succession and duration, or rather it is an experience of *succession in duration*. For the succession, in terms of which we determine what is earlier than, simultaneous with, or later than any given event, has no temporal significance apart from the duration of things or processes, either remembered as past, perceived as present, or expected as future.

An empirical analysis of time will not seek to explain away either of these essential features nor reduce them to any form or schematic order which is by definition nontemporal. The method of experience, as Mr. Dennes has reminded us, takes its start from the consideration of actual states of affairs, whose constituent parts can be directly observed and exhibited in detail. These are the concrete processes to which all analysis must eventually refer if it is to have any empirical significance. For what we directly experience, as actually present and observable, is something going on—some process of qualitative transformation, in which we find indications both of a past history and of future tendencies. In other words, the examination of any actual state of affairs discloses (1) some process which *endures as a whole* over a measurable period, and (2) constituent parts of this process, that is, events which occur in *succession* so that it is possible to characterize some as earlier and some as later in a temporal sequence. These two features of succession and duration are not matters of assumption or definition—they are discovered by direct inspection of any actual state of affairs. Whoever wishes to deny them cannot be refuted. We can only ask him to produce some actual state of affairs in which he asserts that he can find neither duration nor succession. If we likewise fail to find them, further argument is unnecessary. But if we do find them where he fails to find them, further argument is impossible. Whichever happens, the presence or absence of these features of time in actual states of affairs is a question of finding or failing to find them there, not a matter to be settled by dialectical arguments.

Duration implies continuity of a process, in which there is cumulative change, whereas succession implies continuity of a series, in which there is juxtaposition of parts that are external to

one another. Most of the puzzles concerning the nature of time have resulted from the difficulty of reconciling these two kinds of temporal continuity. To consider duration merely as a series of events is, as Bergson has rightly insisted, to lose sight of its essential character of continuous qualitative change. Our conception of a temporal series is a "spatialization" of time, in the sense that we conceive it to be an extension of successive moments through a determinate order of positions. If, however, we consider time as "pure duration" without any serial order of before and after, it is difficult to see how any significant distinction can be made between one part of time and another. How can we assert that an event *A* is earlier than an event *B*, unless we suppose that there is a definite order of succession, as well as a span of duration, from *A* to *B*? We may agree with Bergson that there are elements of intellectual construction in such temporal judgments, as there are in every judgment. But it does not follow that the intellect falsifies our direct experience of time because it necessarily conceives of temporal succession in spatial terms. It is because time and space are inseparable in experience that our judgments of time are necessarily constructed in terms of spatial orders. "Time is really laid out in space and is intrinsically spatial."*

There is no need of reviewing the famous paradoxes and contradictions that have been suggested by this twofold nature of time. My intention is not to demonstrate either its "reality" or its "unreality," but simply to make clear what I mean by time so far as I discern its features in actual experience. Succession and duration are its two essential characteristics. Any attempt to reduce the one to the other or both to a more fundamental order of events is contrary to what I find in temporal affairs, and if dialectic makes them out to be incompatible, then so much the worse for dialectic. We must try, instead, to discover how these two features of time are related without losing sight of their essential difference. This difference can be directly observed when, for example, in the repetition of a musical theme, we hear the tempo augmented or diminished. What we perceive is not, of course, the repetition of an identical sequence of notes, but the same *order* of succession over a longer or shorter duration. There is thus a manifest distinction

* S. Alexander, *Space, Time and Deity*, I:143

between the varied duration of the theme and its recurrent order of succession. To begin with, I wish to consider what is implied by this distinction in the analysis of our time experience.

(1) The division of time into past, present, and future does not represent a *series* as does the division into earlier, simultaneous, and later. For a series must satisfy certain requirements. First, it must consist of terms which stand in constant and reciprocal relations to one another. Any order of terms whose relations were continually changing would not constitute a series in any intelligible sense of the word. But on the assumption that past, present, and future represent distinctions within a serial order of events, we are compelled to say that future events in becoming present and present events in becoming past change their relations to one another in the series as a whole. Furthermore, each event, considered as a term in the series, acquires new relations to other events as it recedes into the remote past. Thus, it violates the first requirement for a series. A second requirement is that each term shall occupy one and only one position in the series. In other words, each term occupies a position from which every other term in the series is excluded. Now, it is obvious that the division of time into past, present, and future does not satisfy this requirement. For if these divisions constituted a series, we should have to suppose that one and the same term could occupy every position in the series, and that each position could be occupied successively by every term in the series. But in order to account for the succession in which every term occupies each position in the series, from the future through the present into the remote past, it is necessary to introduce another series. If this series also involves the temporal relations of past, present, and future, the same problem recurs and we are compelled to postulate one series to account for another *ad infinitum*. If, in order to escape this infinite regress, we suppose that the second series belongs to a nontemporal order, for example, a logical order of ground and consequence, then we are forced to conclude that an empirical succession of events is not really constituted by relations between past, present, and future, and that the experience of time is illusory. But an analysis that ends by denying the reality of that which it set out to analyze thereby undermines its own validity. If Chronos devoured his own

children, his dialectical offspring have more than returned the compliment. The arguments of Bradley and McTaggart, far from proving the unreality of time, merely show the impossibility of conceiving of duration as a serial order of events, without becoming involved in hopeless contradictions. McTaggart* assumes from the start that the distinctions between past, present, and future refer to an "A series," defined as "the series of positions which runs from the far past through the near past to the present, and then from the present through the near future to the far future, or conversely." This is presupposed by his "B series," which is defined as "the series of positions which runs from earlier to later, or conversely." Mr. Marhenke has exposed the confusion of types which this presupposition involves. The notions of change and duration are subjected to requirements which, by assumption, they cannot possibly satisfy. Past, present, and future prove to be incompatible determinations while every event in the "A series" is said to have all of them. For an event is said to change only in respect to the positions that it successively occupies in a fixed series from the far future into the remote past. Hence, an event *M* is alleged to be future at some moment of present time, and present and past at different moments of future time, while every moment, at which it may be past, present, or future, is itself equally a moment of past and future time. How have we been led to such an astounding conclusion? Only by systematically ignoring the differences between temporal succession and duration. Instead of inferring the "unreality" of time from these paradoxical consequences, we may challenge the underlying assumption which reduces past, present, and future to a series of positions, awaiting occupation by successive events. A series of positions signifies a temporal succession only by virtue of the fact that each position is characterized by a simultaneity of events. But events can be regarded as simultaneous only with reference to some span of duration within which they overlap. In short, simultaneity means compresence of events and this implies the notion of duration.

(2) A further contrast between succession and duration, to which I wish next to direct attention, seems at first sight so obvious as hardly to merit discussion. The distinction between the past

* *The Nature of Existence*, II, Chap. XXXIII.

and the future is evidently not equivalent to the distinction between the earlier and the later, since an event may be later than another event and yet be in the past, while an event may also be earlier than another event and yet be in the future. The French Revolution was later than the discovery of America, although both of these events belong to the past. And we can predict that an eclipse of the sun will occur before the next presidential election, although both of these events belong to the future. Nevertheless, some writers have seemed to suggest that the relations of earlier and later in succession are convertible with the relations of past and future in duration. Thus, Mr. Russell has considered the order of events from past through present to future to be the counterpart in mental time of the succession from earlier to later which belongs to physical time.* And Mr. Alexander has said that "earlier and later are, as it were, the past and future of physical Time itself," or, more precisely, "that physical Time is only earlier or later, and that the instants in it are only past, present, and future in relation to the mind which apprehends."† Now, it is a truism that all past events are earlier than those in the future and that all future events are later than those in the past. But it is far from obvious that whatever is earlier in a succession of events must, in some sense, belong to a past, or that whatever is later in a succession of events must, in some sense, belong to a future. Let us examine the formal properties of these two pairs of relations in order to find out to what extent they do or do not correspond. Each is a transitive relation. If an event *L* is earlier than an event *M*, and *M* is earlier than another event *N*, *L* is also earlier than *N*; and if *N* is later than *M* and *M* is later than *L*, then *N* is later than *L*. Similarly, if an event *A* is in *B*'s past and *B* is in *C*'s past, then *A* is in *C*'s past, and if *C* is in the future with respect to *B* and *B* is in the future with respect to *A*, then *C* is also in the future with respect to *A*. Each relation is also asymmetrical. For if *L* is earlier than *M*, *M* is not earlier than *L*, and if *N* is later than *M*, *M* is not

* "On the Experience of Time," *Monist*, XXV (1915): 225 ff. A similar view, though not explicitly stated, seems to be involved in his account of time in *Our Knowledge of the External World*, Lecture IV, p. 125, where he asserts that "events, ordered by the relations of simultaneity and succession, are all that experience provides."

† *Op. cit.*, 45, 95.

later than *N*. Likewise, if *A* is in *B*'s past, *B* is not in *A*'s past, and if *C* is in the future with respect to *B*, *B* is not in the future with respect to *C*. So far, then, we seem to be dealing with corresponding relations. But the matter becomes more complicated when we recall that the distinction between the earlier and the later applies equally to past and to future time. In other words, we may say of any past event that it is either earlier or later than some other event, and similarly of any future event. Is the converse of this also true and does the distinction between past and future apply equally to what is earlier and to what is later in a succession of events? May we say of any two events, whether they are earlier or later than some other event, that one is past and the other future? Our answer must depend, of course, on what event we select for reference. There are three alternatives: we may say of any event, *M*, that it has occurred, will occur, or is now occurring. The question is, whether or not the distinction between past and future applies unequivocally to what is earlier and to what is later than *M*, under each of these three alternatives. In the first, where *M* has occurred, all that is earlier than *M* is past, but nothing earlier than *M* is future. Among the events that succeed *M*, however, we can properly distinguish between those that are past and those that are still future. In this alternative, therefore, the distinction applies only to what is later and not to what is earlier than *M*. In the second alternative, where it is supposed that *M* will occur, all that is later than *M* is in the future, but nothing later than *M* is in the past, so that the distinction does not apply to events which succeed *M*. It does apply, however, to what is earlier than *M*, since it is always possible to conceive of some future event, *L*, that will be earlier than the supposed future event, *M*. In this alternative, therefore, the distinction applies only to what is earlier and not to what is later than *M*. It is in the third alternative alone, where we suppose *M* to be now occurring, that we find complete correspondence between the two pairs of relations. For what is earlier than *M* is coextensive with *M*'s past and what is later than *M* is coextensive with *M*'s future.

We have now seen in what respect the relations of temporal succession differ from the relations of duration and in what respect they correspond. The earlier and later are convertible with the

past and the future only where simultaneity means not only the compresence of events but also their compresence with an event *now occurring*. This result has been reached merely by a formal analysis of the properties of these relations, without presupposing any doctrine of a specious or nonspecious present and without assuming any distinction between physical and mental time. But it is in *the present*, however we may define it, that we have to seek the significance of the connection between succession and duration.

(3) I turn next to the question of the "sense" or direction of time, with respect to its succession and its duration. The classic assumption of Newtonian physics, that Time flows in one direction, and is absolutely irreversible, has recently been challenged by G. N. Lewis on the ground that all the processes known to physics and chemistry are, in principle, reversible processes. He has therefore put forward the alternative thesis of a symmetrical or "two way" time, maintaining "that all the rules which are obtained from a study of physical processes hold with equal validity if these processes are reversed in time."^{*} Thus, in the diffusion of two gases or the mixing of two mutually soluble liquids, resulting in an approximately uniform concentration, it is a theoretic possibility that the process might occur in the reverse order and the two constituents return to their initial state of separation. "Indeed, according to Boltzmann, the separation will occur spontaneously if the system be left to itself for a sufficiently long period." None of the phenomena of mechanics, thermodynamics, radiation, or electromagnetics require the notion of a "one way" time for their elucidation. The second law of thermodynamics, to which Eddington has pinned his faith in the irreversibility of time, need not be interpreted to mean a "running down" process in the physical world. "The increase of entropy comes when a *known* distribution goes over into an *unknown* distribution. . . . Gain in entropy always means loss of information and nothing more."

Now, no one can legitimately deny the right of the physicist to employ the concept of time in abstraction from its wider but less exact significance in ordinary experience. Physical concepts are applicable to certain determinate features of events that have been

* "The Symmetry of Time in Physics," *Science*, LXXI (no. 1849, June 6, 1930). 569-577, cf. *The Anatomy of Science*, pp. 143-145

selected and marked out for experimental study. The validity of these concepts and the explanations in which they function does not depend on any philosophical theory. It is a question of their ability to advance the kind of experimental verification for which they are intended. In this sense, *the world of physics* is "closed to mind" But this does not mean that *the physical world* is "closed" to a philosophy of mind. It is proper to ask, in a philosophical inquiry, what features of the physical world have been included and what features omitted in the physical concept of time. I am not competent to estimate the validity of this particular thesis about the symmetry of time in physics. But we may ask, What are the characteristics of physical occurrences to which its arguments are relevant? Does the notion of a "two way" time denote the actual reversal of a process in time, or merely the reversibility of the order of succession in a temporal process? If the former is intended, we should have to suppose that the end of one and the same process might also be its beginning. Both Mr. Strong and Mr. Dennes have rightly insisted that no actual process is reversible in this sense. A man might conceivably be rejuvenated so that he lived over again every stage in his earlier career in the reverse order from old age to infancy. Such a rejuvenation would be, not the literal reversal of his life, but the temporal continuation of that life process in the opposite direction. If two gases after diffusion are restored to their initial state of separation, the diffusion is the outcome of one process and the separation is the outcome of a further process. The symmetry of time in physics must therefore mean the reversibility of an *order* of succession among physical events and not the actual reversal of a process in time. It means that the physical sciences are dealing with the relations of temporal succession in abstraction from the relations of past, present, and future. The equations which describe a succession of events when it is read off from earlier to later, apply as well to that succession when it is read off in the reverse direction. It is characteristic of the scientific outlook, with its emphasis on prediction and control, that it should be more concerned with an ordered succession than it is with the duration of events.

Are we to conclude from the foregoing argument that the concept of time in the physical sciences has an independent signifi-

cance wholly apart from the historical time of memory? I venture to suggest that the time coefficient in the equations of physics derives its *temporal* connotation from the differences we discern in an actual process between its past history and its future possibilities. The relations of earlier and later in an order of simultaneity and succession are indistinguishable from the relations of before and after in a nontemporal series unless we postulate a reference to past and future. Mr. Lenzen explained how a conceptual schema, employed in measuring the duration of a physical process, is tied to the succession and simultaneity of events in experience by the correlation of striking events with instants in the schema. The measurements are relative to a frame of reference, and the clock readings in a stationary frame are different from the clock readings in a moving frame with respect to the same events. The variability of time measurements in different frames of reference is accounted for by a relativistic theory of time. But the *fact* that a clock in a moving frame lags behind one in a stationary frame is, as Mr. Lenzen remarks, independent of any philosophical theory of time. Perhaps he would be willing to add, however, that the fact only has this meaning with reference to certain presuppositions whose analysis requires a philosophical rather than a strictly physical conception of time. The mere fact that the mechanism of one clock has registered five units while the mechanism of the other has registered six, does not mean that the first "lags behind" the second, except on the assumption that the fifth unit stands for an *earlier* instant and the sixth unit for a *later* instant in a metrical schema of time. And this assumption is based, as we have seen, upon the directly discernible differences between the past history and future possibilities of an actual, ongoing process. Otherwise, how are we to say that our clocks are not going backward instead of forward?

This brings us to the crux of the matter. The relations of the earlier to the later in a temporal succession imply the occurrence of one event before the occurrence of another, so that the direction is *from the past through the present toward the future*. But the direction of time in the duration of a process is exactly the reverse. Possibilities become actualities in the present and these actualities endure into the past. There is a sense in which we can say that the

history of a process *follows* its enactment, and that this, in turn, is *preceded* by its possibility in some other process. Now if the concept of time implies both succession and duration, or rather refers to our experience of succession in duration, we seem to be faced with a more serious difficulty than that involved in the suggested symmetry of physical time. For while the latter means that time may have *either* of two directions, the position we have now reached suggests that it must have *both* of them together. One point is clear: if time is comparable to a single stream or procession, we cannot conceive of it as having a double "sense," since it is impossible to think of a stream flowing in two directions at once. But I find no empirical evidence or logical necessity which constrains me to think of time as a flux. To borrow the scholastic distinction, which Mr. Strong has so aptly applied, we may say that events occur *in* time and that processes endure *with* time; but time is not an event that occurs nor a process that endures. If we speak of time passing, this is merely an elliptical phrase for the passage of events in some order of succession, or else for the persistence of some process which we experience as enduring through the present into the past. The directions of time are directions of *reference*, not directions of motion. We conceive of a succession of events as arranged in a series, in which the later terms complete the order implicit among the earlier terms. Now the end or aim of a series is not a last term (for it is not necessary to suppose any last term), but the total arrangement of the terms in a certain order. Thus, the characteristic of any serial order is the *anticipation* of the later terms by the earlier.* Such anticipation has its empirical basis in an observed succession of events within the duration of some process. It means that our experience of temporal succession is characterized by a reference of past and present events to future possibilities. But we also conceive of a temporal process as the persistence of some structure or pattern of activities in which possibilities become realized in actual occurrences and these in turn retreat into the past, leaving historical traces behind them. As the characteristic of time, conceived as a serial order, is *anticipation*, so

* Cf. H. Cohen, *Logik der reinen Erkenntnis*, p. 131. A series has its own arrangement as its aim or end. Thus, it is prospective rather than retrospective in character. Anticipation is "das Charakteristikum der Zeit," and the future "enthalt und enthult den Charakter der Zeit."

the characteristic of time, conceived as an historical order, is *retention*. Future possibilities are suggested by actual tendencies and these, in turn, are indicated by the traces of past events retained in the present. The source and locus of this mode of temporal reference are within the present although its direction or "sense" is from future through present to past.

All the foregoing considerations concerning the relation of succession to duration have brought us back to the notion of the *present*. We have found that it is only through its connection with a present occurrence that a series has any temporal significance. For the distinction between the earlier and the later terms in a series implies simultaneity, and simultaneity means the compresence of events. Again, it is only from the present, taken as a standpoint of reference, that what is earlier in a succession of events corresponds to past duration and what is later to the future. And, finally, we have seen that the "sense" or direction of time means a direction of reference, whose source and locus lie within the present situation. We must now ask how we are to conceive the *presentness* of an event in distinction to its pastness or futurity. The assumption that the present is itself *in* time, either as a passing moment or a mathematical instant, has introduced much needless confusion into this problem. It underlies Zeno's famous puzzle, of the moving arrow and most of the paradoxes that have sprung from that source. For while it is true that the time of a motion or any other process consists of indivisible elements or instants, it does not follow, as Zeno contends, that there must be a *state* of motion present at each instant through which the motion as a whole is successively realized. In other words, there is no actual infinitesimal of time that can be identified with a present moment.* This is perhaps what Plato had in mind when he referred to the "immediate now" (*τὸ ἐξαίφνης*) as "that incongruous affair lying between rest and motion, not being in any time." For if change implies being in one condition at one time and in a different condition at another time, how can the immediate transition itself occupy any time of its own? The answer is that it cannot, for the reason that there is no present moment *in* time which actually divides the past from the future stages of a continuous process.

* Russell, *Principles of Mathematics*, I:350-351

The notion of an instant of time is an ideal limit to which our measurements of motion successively approximate without ever actually reaching it. Thus, we can conceive of an ideal form of motion as rectilinear, in which equal distances are covered in equal times. But in any actual path, on account of its curvature, the motion will be merely an approximation to the limit of uniform rectilinear motion over shorter and shorter lengths, and it is only in the limiting case that we can speak of the *instantaneous* value of the velocity of a moving body.

If no instant of time is ever actually present, how then are we to conceive of any succession of instants as being present together? And if neither one instant nor several are ever actually present, how can there be any present time at all? It was, I suppose, partly to meet this difficulty that the notion of a "specious present" was introduced. For whether we scan the distant future or recall the remote past, we remain inescapably within the present. As Mr Dennes insisted, all that lies beyond its purview is for us an ideal construction. "All that the most learned historian or the deepest theologian has ever actually conceived," says Mr Santayana, "must have come to him in the specious present"* But in saying this are we asserting anything more than the tautology that we always are wherever we happen to be, or that we only feel and act, know and opine, whenever we happen to be doing so? Such a truism, trivial as it stands, might indeed acquire a certain moral significance, as serving to remind us that we have to use whatever materials are at our present disposal in order to accomplish our future ends. But if the notion of the immediate present is to provide any clue to the meaning of time, it must possess some distinctive character of its own. How, then, are we to distinguish what is here and now, in its temporal immediacy, from what was or will be? The "specious present," of which we are said to be directly aware, contains a past that has just gone and a future that is just coming. Although it is apprehended in a single act of attention, it is supposed to consist of a finite span of duration, "varying in length from a few seconds to, probably not more than a minute."† To be sure, the present, in a strict mathematical sense, is *conceivable* as an absolute division between the past and the future. But

* *The Realm of Matter*, p. 69.

† James, *Psychology*, I:642.

this is an intellectual abstraction and not an element in our perception of time. In the sensible or specious present, the qualities of pastness and futurity are merged into one continuous state of awareness, so that there is no given instant at which it can be said that any of its contents are definitely past or definitely future.

This doctrine has been so widely accepted in contemporary philosophy that one might well hesitate to question its validity if the way had not been already prepared by Mr. Loewenberg's arguments. He has affirmed the existence of a "nonspecious present," and I shall venture to deny the existence of a "specious present." For I confess that, after considerable effort spent in canvassing my own experience, I can find not the slightest evidence for this notion in my perception of time. There is for me no characteristic of the present which remotely suggests a "saddleback" or indicates that it is "a duration with a bow and a stern." Indeed, I do not apprehend the present as either enduring of itself or moving with an incoming future toward an outgoing past. What I seem to find, on the contrary, is the endurance of things, with their changing qualities and relations, *in the present*. And this present is at least as extensive in its reference as the processes with which it is connected, whether these processes are remembered, perceived, or anticipated. But I shall be told that this is not what is meant by the *specious* present. In order to identify that, I must subject my own conscious activity to reflective analysis. In listening to a musical phrase, for example, am I not aware of one note fading into the past just as the next note begins to be heard? I do not find this to be so. What I hear, or seem to hear, is one note fading into another note, or the continuously changing qualities of the music itself. If the sound seems to fade or grow in volume, this is for me part of the present process to which I find myself attending. "But how much of the music do you hear at once?" The point of that question lies in the little phrase "at once." For there are, I suppose, almost insuperable difficulties in trying to estimate exactly how much of a piece of music an auditor does or does not actually hear, when he appears to be listening to it. "Whatever you do hear, then, how much of it do you hear *at once*?" I answer that if the phrase "at once" means "in the present," then I hear whatever I do hear of

from beginning to end, I hear in the present, if I hear it at all. How else could I hear it? Obviously, not in the past or the future. But if the phrase "at once" is to mean "within a single small span of attention," I am compelled to reject the assumption on which the question depends. For I do not find that my experience of listening to music consists of successive pulses or spans of attention.

That both memory and anticipation are involved in the act of perception, I do not doubt. That the phrase, as I hear it played, has a finite duration is also beyond dispute. But that the *present*, in which this whole complicated process occurs, is itself a limited interval of time seems to me a highly questionable assumption. For I find it impossible to set any temporal boundaries to my present experience, such that I may say, "At this moment one specious present comes to an end and another specious present begins," or, "Here is the tapering-off of one present into the past, and here the budding of another present out of the future." Should an experimental psychologist happen to be measuring the time of my reactions on a stop watch, the recorded intervals would doubtless be comprised within *his* present experience, but I am confident they would not describe the limits of *mine*. They would measure my visual, auditory, or other responses to selected stimuli, but they would not determine the extent of whatever might or might not be present for me in that situation. However, let us suppose, for the sake of the argument, that the sensible present has duration and is somehow distinguishable into an incoming and an outgoing part. Even so, I fail to see how such a fact could ever get itself reported. To say that the measurement of his reaction time by another observer marks the extent of the present moment for the percipient himself is a flagrant example of the "psychologist's fallacy," confusing the observer's standpoint with that of the mental fact about which he is making his report.* Furthermore, the nature of the experiments which are supposed to disclose the time span would seem to make it impossible for the percipient to report the duration of his own "specious present." In trying to discriminate rapid "clicks of sound," flashes of light, and the like, how could the distracted victim of the experiment also contrive to analyze his own time experience? Unless there were some way for

* Cf. James, *Psychology*, I:196.

him to indicate that so many clicks or flashes, and no more, were comprised within what he experiences as a single present, such experiments could have no bearing on the perception of time.

If time does "grow by finite buds or drops," as James supposed, I can conceive of no possible means of verifying it. Indeed, such a supposition savours of the miraculous, since all "the germs of memory and expectation" are said to be contained within each of these momentary drops of time that we call a "specious present." All that I remember of the past and expect in the future must somehow be telescoped into that brief span and reduced to feelings of pastness or futurity in a moment of consciousness. I am therefore compelled to conclude, with Mr. Alexander, that "the 'specious present' is not present at all, . . . that what it describes is not a fundamental fact of our time-experience, and that rather it misinterprets that experience."* The "breadth" of the present denotes the extent of its objective reference, not the extent of its temporal span, since it has none. When we remember events in the distant past, we do not expand our present duration. Nor do we contract it when we confine our attention to matters of direct acquaintance. The present is rather the temporal *perspective* through which we distinguish longer or shorter periods of time and thus are able to measure different durations. Within the present, we perceive a succession in duration and distinguish the earlier from the later. But the present time is not itself an event in a succession of events, nor is it a process that endures over a measurable interval. As I write these words, I am aware of a certain situation which differs in its immediate qualities from what I remember as a similar situation yesterday. It is characterized by that "warmth of intimacy" that belongs to present experience. I am sitting at my desk, with typewriter before me, and I read the words that I wrote a few minutes ago. On a shelf at my left, I happen to see Kant's *Critique of Pure Reason*. Turning to the right, my glance falls on *The Dialogues of Plato*. Looking up, I see a puff of smoke ascending from my pipe and beyond that the various familiar features of my study. From the street I hear a dog bark and the screech of brakes on a car at the corner. All these details are either coming and going, or else persisting, within that total state of affairs that I call my

present situation. If they go, they leave traces behind them in this same present; and if they remain, they can be observed again in this same present. That I did write certain words a few minutes ago is indicated by the presence of those words on the paper before me now. In order to make sure that I saw the volume of Kant and the volumes of Plato on my shelves, I have only to look again and find them there. But I can no longer hear the bark of the dog or the screech of the brakes. Does this mean that they have somehow faded away into the past, taking a part of the present situation along with them? Does their absence make this situation another and a different present? That seems a strange way of putting it. These sounds, like the puff of smoke, have been diffused into the surrounding atmosphere, and with adequate facilities I suppose it might be possible to locate their physical constituents somewhere in space. As perceived events, they passed with the changing processes of my present situation. But I fail to see that the *present* went with them, to be replaced by another present. "Quite so," someone may reply, "you fail to see that the present is a passing moment because you have failed to distinguish between your conscious acts of attention and the external objects to which they refer. You believe that certain objects remain present, but your immediate states of consciousness are continuously passing away and being replaced by new ones. And it is to these momentary states, not to the supposed permanence of their objects, that you owe your sense of present time." To such an objection I can only reply that I am unable to discover this assumed distinction between a subjective state of consciousness, and objective events in my own experience. What I mean by "attention" is simply the fact that certain events or processes are selectively discriminated within a perceptual situation. The act of discrimination may itself be subject to further psychological analysis. But such analysis cannot create a state which the discriminative act did not possess when it occurred in my experience,—namely, a moment of consciousness constituting a specious present.

In addition to the oft-quoted metaphor of the "saddle-back, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time," James has another figurative description of the present, equally picturesque and more

to the point. "The specious present, the intuited duration, stands permanent, like the rainbow on the waterfall, with its own quality unchanged by the events that stream through it."* At the risk of seeming too literal-minded, we may ask how a present which lasts for a limited period of time can also "stand permanent." In our conception of the present, we are perhaps too much influenced by an inveterate tendency to polar expression, so that we suppose that whatever is not in motion must be at rest, and *vice-versa*. But if all motion and rest, all passing away and persisting, are distinguished only as features of events and durations in the present, it is meaningless to ask whether the present itself is moving or at rest, passing or persisting. The "permanence" of the present is what Mr. Santayana has called "the ubiquity of actuality." It is simply another way of saying that "presentness is a character intrinsic to all existence."† In his conception of the present as a finite duration, James betrays the influence of a tradition with which the main trend of his philosophy was at odds. The doctrine of the specious present is the illegitimate offspring of an older and discredited sensationalism combined with his own functional psychology. While he had come to recognize that a simple sensation is an abstraction and that our cognitive experiences are not built up out of sensations, James could still speak of "elementary sensations of duration," or units, "which the time-sense is able to take in at a single stroke."‡ Thus, the specious present is said to be "the unit of *composition* of our perception of time,"§ after the fashion of Locke and Hume. Now the whole tenor of James's philosophy was opposed to this psychological atomism and the psycho-physical dualism on which it depended. He was developing a functional theory of mind with emphasis on the continuity of experience. Yet he still retained the view that sensations are sources of knowledge, although not its components, and that knowledge is to be described in terms of "consciousness," as a subjective correlate of physical and physiological activities. His notion of "the stream of thought" was a temporary compromise between the older and newer types of empiricism, and one that he later came to regard as inadequate to "the realities of experience." In the light of the further develop-

* *Psychology*, I:630.† *Psychology*, I. 611.

ment of his philosophy, the following argument for the speciousness of the present is highly significant.

A simple sensation . . . is an abstraction, and all our concrete states of mind are *representations of objects* with some amount of complexity. Part of the complexity is the echo of the objects just past, and, in a less degree, perhaps, the foretaste of those just to arrive. Objects *fade out of consciousness* slowly. If the present thought is of A B C D E F G, the next one will be of B C D E F G H, and the one after that of C D E F G H I—the lingerings of the past dropping successively away, and the incomings of the future making up the loss. These ~~lingerings~~ lingerings of old objects, these incomings of new, are the germs of memory and expectation, the retrospective and the prospective sense of time. *They give that continuity to consciousness without which it could not be called a stream* *

Here was a representative theory of perception grafted onto his conception of "the stream of thought," and it was, as he says, to establish the continuity of consciousness under the requirements of such a theory that the doctrine of a specious present was adopted.

In his later *Essays in Radical Empiricism*, James was led to deny that the word "consciousness" stands for an entity, insisting instead that it stands for a function. "There is," he says, "no aboriginal stuff or quality of being, contrasted with that of which material objects are made, out of which our thoughts of them are made; but there is a function in experience which thoughts perform, and for the performance of which this quality of being is 'invoked' "† It will be recalled how, in the light of this functional theory, he meets the traditional problem of knowledge. how can the selfsame thing "be in two places at once, both in outer space and in a person's mind?" How, for example, can this one identical room, in which you are now sitting, be counted twice over, as part of your conscious experience and as part of the physical world? His answer is that the one room can belong to two distinct processes just as one identical point can be on two lines, namely, if it be situated at their intersection. Starting from any specific experience, as a member of diverse processes, we can trace its past history and future tendencies in various directions. And this is the meaning of "the present." The present situation permits of various future possibilities because it is itself the convergence of a number of different processes, each with its respective history. There is thus a temporal perspective into the past and future which is pecu-

* *Ibid.*, I:606, italics mine

† *Essays in Radical Empiricism*, p. 3

liar to the present. This occasion—this actual experience of being here in this room—is the culmination to date of the personal biography of each of us, and enters simultaneously into our several life-processes. But it also enters into the history of the room in its physical context. Each observer can treat this selfsame state of affairs as belonging with different contexts—either as part of his “field of consciousness,” or as “the room in which he is sitting.” Nevertheless, as James remarks, it enters both contexts in its wholeness, not attaching itself to the personal biography by one of its aspects and to outer reality by another.

The presentation, the experience, the *that* in short (for until we have decided *what* it is it must be a mere *that*) is the last term of a train of sensations, emotions, decisions, movements, classifications, expectations, etc., ending in the present, and the first term of a series of similar “inner” operations extending into the future. . . . On the other hand, the very same *that* is the *terminus ad quem* of a lot of previous physical operations, carpentering, papering, furnishing, warming, etc., and the *terminus a quo* of a lot of future ones, in which it will be concerned when undergoing the destiny of a physical room.*

James himself, so far as I am aware, never made any attempt to reconstruct his conception of time in the light of his radical empiricism. Had he done so, I believe he would have been compelled to revise much of his earlier doctrine of the specious present. For with the rejection of “consciousness” as an entity, the foundation of that doctrine is cut away.

Let us say, therefore, that the present is a *conjunction of histories*, constituting a twofold perspective into the past and the future. We shall understand by the term “history,” not a record or an interpretation of the past, but a process leading up to a given state of affairs and culminating in it. Now, it is often convenient to consider a single line of historical development in abstraction from other histories, and especially from one’s own personal biography. But its terminus in some designated event could not then properly be described as an actual *present*. A single history, taken by itself, represents an order of succession with dates, earlier and later, but without any *present* date. Thus, we might follow the constitutional history of England from the time of the Conquest to the signing of Magna Carta, but we could not conceive of the latter

* *Ibid.*, pp. 13–14.

event as having been actually present unless we assumed the standpoint of some real or imagined observer into whose personal biography it might have entered. The quality of presentness is ascribed to that event, not by virtue of the supposed observer's span of attention (for of that we can say nothing at all), but by virtue of the conjunction between his own life history and the history of the English Constitution, both converging in that selfsame event. A single history is intelligible without reference to an individual perspective, but the converse is not true. Not only is a perspective determined by the actual history of the percipient, but also the present situation which it defines is essentially characterized by traces of the past and tendencies toward the future. A mere section of space-time that is not an historical perspective is an empty abstraction.

From the conception of the present as a conjunction of histories, one of which is the life history of the percipient, it follows that there can be no present moment of time that is common to all perspectives. The denial of absolute simultaneity between events means that their location in space and time is relative to the standpoint of an observer. In principle, no two observers can perceive the compresence of two events at exactly the same instant. Each observer, for example, will see the same star cross the meridian at a slightly different time. The "world line" of each observer intersects the "world line" of the star at different point-instants. In other words, there is a slight temporal displacement of the date of the occurrence in the two perspectives. It may be objected, however, that this account of the present is incompatible with the doctrine of the finite velocity of light, that the content of perception always occurs later than the real object which we are said to know by virtue of that perception. "It is with a certain phase in the history of a distant star that the astronomer, gazing through his telescope at a given moment, is supposed to become acquainted; but that phase, and perhaps the star itself, have, ages since, ceased to be, and the astronomer's present sense-data, . . . whatever else they may be, are not identical with the realities they are believed to reveal."* If, therefore, on the one hand, we are to speak of a conjunction of histories, or an intersection of "world lines," are we

* Lovejoy, *The Revolt against Dualism*, p. 19.

not driven to the absurd conclusion that what is a present moment in the experience of the observer is also a moment in the remote past of the star? On the other hand, if we admit "that there is a temporal sundering, and therefore an existential duality, of the content given and the reality made known to us through that content,"* are we not compelled to locate the former in the "specious present" of immediate experience, from which the latter is necessarily excluded? But if it is the reasoning and not the character of the present that is "specious" in this argument. As I have pointed out elsewhere,† it depends on the irrelevant assumption that a sense-datum either does or does not stand in a relation of *identity* with its object. When it is shown that the datum does not belong to the object, either as a part to a whole or as an attribute to a substantive, the conclusion is drawn that it must be existentially separate from the object. But why need we suppose that data are either identical or nonidentical with their objects in either of these senses? The essential character of a sense-datum is to be a *sign*, whose function is to indicate the existence of the object and disclose its properties. This indicative relation between datum and object can hardly be used as a basis for denying that the former "belongs" to the latter in the only sense in which it could be said to belong to it, and hence doubting the very information which the datum alone can supply. What is empirically present is the whole perceptual situation within which subsequent analysis may discriminate the various constituents in their several contexts, whether astronomical, physical, biological, or psychological. But unless actual observation did indicate the presence of distant bodies in the field of vision, we should have no means of determining the finite velocity of light. To argue from this doctrine that the appearance of the star belongs to the present while its existence belongs to the past, is doubly specious. It denies in the conclusion what has been assumed in the premises, namely, that it is a star, and not something else, which is perceived as a speck of light crossing the meridian at the present moment. Furthermore, the argument confuses an order of succession in astronomical time with an

* *Ibid.*, p. 18.

† "The Displacement of the Sense-Datum," *Jour. Philos.*, XXIX:10 (May 12, 1932).

order of succession in psychological time. I can see no reason for denying that the real star is now perceived by me as it now exists, simply because its date in one order of measurement does not happen to coincide with its date in another order of measurement. Indeed, it would be surprising to find that they did coincide, since we are dealing with histories whose interpretation implies different contexts.

We return then to the previous argument, that our time experience is an experience of succession in duration; that we distinguish what is earlier from what is later in a succession of events only with reference to the past and future of some enduring process; that the reference to a past or a future has its source and locus within the present; and, finally, that the present is a conjunction of histories, including the life history of a percipient and thus constituting a temporal perspective of past events and future possibilities. Any perspective other than that which pertains to the enjoyed present must be for each of us an ideal construction. We can conceive of a present in the past or a present in the future, with its own retrospective and prospective reference, but such a present is necessarily fictitious. We must, as we say, think ourselves back into the past or forward into the future. In order to do this, we have to create an imaginary situation in which events that are really past or really future enter into the personal biography of some fictitious percipient. Mark Twain's *A Connecticut Yankee in King Arthur's Court* and Edward Bellamy's *Looking Backward* are typical of such constructions. For whether the author tries to disguise or reveal it, the peculiar bias of his own enjoyed present is necessarily involved in the imagined perspective. Also a construction, although in a different sense, is the mathematical present which is defined as the present instant. This is an abstract division between past and future events according to a schematic order of measurement. From some periodic process, such as the rotation of the earth or the swing of a pendulum, a unit of duration is selected to serve as a uniform standard of measurement. The uniformity of the standard depends upon the regular recurrence of phases in the processes from which it is derived, and this regularity can only be determined by a set of inductive inferences.*

* Cf. Cournot, *Essai sur les fondements de nos connaissances*, Chap. X.

Thus, the division of time according to a chronometer implies judgments of probability concerning the future recurrence of phases with which a succession of events is congruent. And the notion of an instant at which there is a simultaneous occurrence of events represents a set of them in such a relation to congruence. More precisely, an instant of time may be defined as "a group of events of which any two overlap, so that there is some time, however short, when they all exist."* But if an instant is a class of events referred to a standard unit of duration, it cannot be regarded as an actual constituent of an enjoyed present.

Thus, we may speak of the present in three different senses: (1) the *enjoyed present*, which characterizes the perceptual situation in which we experience actual, ongoing processes; (2) the *imputed present*, which has a merely methodological significance as a standpoint of reference to a "future in the past" or a "past in the future"; and (3) the *schematic present*, which defines a class of congruent events "at an instant." The first sense is the original from which the other two are derived by an ideal construction. Hence, it is the notion of historical time that provides the clue to the meaning of time in other contexts. Our time experience is the experience of a succession in duration within the perspective of an enjoyed present. The present is characterized by the retention of past histories and the capacity for future developments. Memory is the apprehension of duration through the retention of the past, and expectation is the apprehension of succession through the capacities for the future. How memory can be veridical and whether it is an indirect representation of the past or a direct acquaintance with it, whether judgments about the future can be true or false, and what they refer to,—these are questions which would lead us far beyond the proper duration of this lecture. Something will always remain to be said about time, but there is not enough time in which to say it.

* Russell, *Our Knowledge of the External World*, p. 126; cf. Whitehead, *The Concept of Nature*, Chaps. IV and VI.

TEMPORAL FORM AND 'EXISTENCE

BY

GEORGE P. ADAMS

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THE PROBLEM OF TIME, like other philosophical problems, is a focus of many questions. The answer given to any one question presupposes an examination of other questions. The philosopher is embarrassed by the necessity of clarifying some prior concept before he settles down to a consideration of any one concept. Before you can enjoy after-dinner coffee, you must have dessert; you cannot have dessert until you have eaten the roast; and so on back to the salad and soup. But we are threatened with philosophical starvation just because we cannot really enjoy our philosophical soup or salad until we have had our philosophical dessert, and *vice versa*. Instead, we are compelled to take one thing at a time, dispose of it, and go on to the next. We meet the problem of Time the moment we cross the threshold of philosophical reflection. The serial order of before and after, of change, succession, and supersession, means one thing or event at a time, its recession and replacement by a successor. It is done with and disposed of, to it we can never go back. But the order and structure with which reflection has to do would appear to posit and demand not only something different from this, but quite the contrary. It is circular and not serial. Every starting place is tentative and hypothetical, subject to revision and reinterpretation. Its context is massive, multidimensional, fluid in all directions. The arrow of reflective thought, unlike time's arrow, is not set on a single unvarying course. It is not surprising that all but a very few of the first-rate philosophers should have concluded that the temporal order of before and after, universal though it be, is not the last word about our experience.

All the speakers who have preceded me are in agreement upon one point, namely, that what time denotes is not any entity which either does or could exist by itself. There is no time *per se*, no

empty time, logically or existentially prior to and independent of things and events which are said to exist in time. Time is not substantival, but adjectival or relational. I am not sure that any philosophers, other than certain natural philosophers such as Newton, have ever really thought otherwise. Because they talk about the noun "time," it does not follow that they take time to be a substantive kind of thing which might exist by itself. Time denotes some discriminable aspect or ingredient of things and events, and one is absolved from remarking upon this when using the term.

Why do we so easily fall into the habit of thinking and speaking of an empty or pure time, a dimension infinitely extended in two opposite directions within which things and events, including ourselves, exist and occur? Why do we hypostatize Time, and confer upon it an independent, substantive status? There is, I think, something more in evidence here than our general human propensity to hypostatize abstractions. Color is a quality which belongs to every perceived object; it is adjectival and pervasive; yet we are not tempted to erect a world of empty color in which colored things exist. We do just this for space. Persistence and change are experienced temporal qualities equally adjectival and pervasive. But instead of erecting persistence and change into substantive existences, we think of an empty time in which things persist and changes go on. Why do we translate the temporal quality of things in this manner? I think that we do this because the temporal quality of things is not just a simple quality, as hardness and color are qualities of my table. Change and persistence are indeed qualities of things and events. But they are relational qualities, that is, qualities which exhibit a pattern, a relational structure, a form or schema. The relation of succession, of before and after, is displayed within every so-called temporal quality. A schematic relational structure is intrinsic to temporal quality. This renders temporal quality different from the ordinary run of experienced qualities. The redness of the rose, the pain of a toothache, are no doubt dependent upon the relations in which the rose and the tooth stand to sense organs, nervous system, and various physical processes. In this sense these experienced qualities are relational. But these relations are, so to speak, extrinsic to the felt qualities. Within these qualities are dense and opaque. They exhibit little

or no wealth of internal relational structure. Series, intervals, and types of order, providing a field for geometry and analysis, are here in abeyance. They just are what they are, felt, intuited essences or qualities, whose intrinsic nature is exhausted in the immediate experience of them. I do not think that this is quite the last work about them, but it will serve to mark the great difference between all such qualities and temporal quality. Temporal quality is not internally opaque and merely qualitative. It provides an inexhaustible and fertile domain for analysis which felt colors and toothaches do not. It is because of this difference that we find it not only easy but seemingly inevitable to endow Time with an independent and intrinsic nature. The relational quality pertaining to felt temporal quality cannot be confined to the situation which presents us that quality, in the way in which we do think of the redness as being in the rose and the ache as being in the tooth. For, whenever we discern a pattern, a formal relational structure within a mass of presented data, we have something which can be set free from its present locus and embodiment. It can now be thought of as applicable to other instances, as characterizing areas of existence beyond the boundaries of presented fact. There are features of presented situations which are given and discerned as universals in a quite literal sense, that is, as having a more general scope and applicability than merely to the particular instance in which they are here and now presented. This holds of qualities as well as of relational structures. The minimum of any presented datum is always a this-such, where the quality, the suchness, contains the possibility of further, indefinitely extended application. But in relational qualities this feature is fraught with a peculiar significance. Where a pattern or structure, characterized by a defining relation, is discerned within given experience, its extension beyond the given becomes even more clearly indicated. Its wider applicability is an intrinsic meaning of the pattern itself.

It is as if we were presented with a small stretch of real numbers, say those between 5 and 8, and that we discerned the formal structure exhibited within this presented stretch. The relational schema thus presented would be discriminated from a particular entity falling within the presented stretch, such as the number 6.

This discrimination of a relational structure from its content or matter is at the same time an indefinite extension of the schema beyond the boundaries of the presented situation. We think of the formal schema as applicable to what is not here and now presented. An architect's plan for a house could be used for building many houses in different places. The plan is adjectival. It is the plan of some house, actual or possible. The reification and hypostatizing of Time expresses, no doubt crudely and mistakenly, the discovery within felt temporal quality of a relational structure, internally inexhaustible and externally extended and indefinitely extensible.

I shall take time to be then a feature, adjective, or quality of things experienced. I take the temporal quality to be utterly pervasive and universal. It has no merely restricted exemplification like the qualities, "sweet" and "hard." Can we describe this universal temporal quality of things experienced in terms of a single relational quality, a single type of pattern, or is it complex, containing two or more different structures? I shall hold that *the* temporal quality is the relational quality of earlier and later, of before and after, of succession. The defining characteristic of time is successiveness. This statement requires me to consider certain views according to which there is a temporal quality independent of succession. I begin by asking whether we have any experience of temporal quality which does not exhibit succession. Can we ascribe any meaning to temporal existence which is not characterized by the serial order of before and after? I do not think that we can. However, there are those who appear to think otherwise. Mr. Mackay apparently wishes to distinguish quite sharply between duration and succession. I understand him to say that in the direct experience of something going on, of continuous qualitative change, we have duration but not succession. Succession means a series. Duration is not a series of events. Moreover, we are told that past, present, and future do not constitute a series, that a past event can be specified as past without reference to the temporal relation of earlier and later. The order of duration runs from future possibilities through the present and enduring into the past. What Mr. Mackay speaks of as duration appears to be what Mr. Loewenberg called "persistence." Reality means dura-

tion and persistence, these specify the real, nonspecious, non-successive present

Now this distinction between duration and succession is, I agree, significant and fundamental. It constitutes the crux of the problem of time. But we may take the distinction in two ways. Either we have an experience of duration from which there is lacking any before-and-after serial order of successiveness, or our experience of duration is one in which there is succession, with its order of earlier and later, plus something else. If it should be the latter that we have, the temporal relation of before and after would be one aspect of duration, persistence, and the present, but it would not exhaust either what we experience or what we mean by duration and persistence. It would be the pervasive abstract temporal form of whatever perdures and persists. And it seems to me to be the temporal aspect of experience, *par excellence*. What a duration or a persistence might be in which there simply is no serial order of succession, I can neither imagine nor conceive. If anything persists or perdures, then the temporal pattern of earlier and later does characterize the enduring somewhat, whether I reflectively discriminate it or not. Of course, the present may be enjoyed without analyzing out its temporal schema, the before and after succession of its enjoyed contents. When I listen to music, I do not keep saying to myself that the melody I am hearing exhibits the temporal pattern of before and after. But when I do reflectively consider what I am hearing, and thus perhaps spoil the enjoyment, I immediately find just this temporal pattern of earlier and later. Duration is more than succession, but it is always at least succession.

If we take the temporal pattern of succession as pervasive, if duration and persistence are also successive, whatever more they may turn out to be, then it follows that we cannot hope to escape the metaphysical problems set by the relation of before and after through the discovery of a temporal quality in which succession is lacking. The analysis of the temporal pattern of before and after, of succession, provides a crucial test of philosophical method. In the problem of time are focused all the perplexities and paradoxes of the given, the presented, and the present, of transcendent reference, of experience and meaning. Let us begin with the inno-

cent attempt to analyze the meaning of any concept or term. We employ a great variety of terms signifying the temporal quality of things. How can we tell whether a term stands for anything and, if so, what it is to which the term points? Every term can be defined by means of other terms, and dictionaries exist in order to display this reference and cross-reference among words. But if terms are ever to denote things which are other than words, this area of terms in discourse must be broken into and invaded. The term must initiate a process which leads away from discourse into things. What thing can a word stand for? Obviously, it must be some thing which is presented to us or had by us independently of being named. It must be experienced before it is named and in order to be named. Otherwise the name would be a conventional symbol or synonym of some other name. Of course, what *de facto* name shall be employed to denote anything is an arbitrary affair. Any other name might have become attached to the thing. But once attached, that name has a meaning, it denotes a thing in some manner presented before it is named. What else can naming, thinking, and reflecting do except to indicate some experienced state of affairs or some trait which, on the basis of experience, may be inferred? Is there any theory of meaning other than an empirical or operational one which can possibly make sense? How can you ever know what you are talking about unless it is first presented to you in actual experience? The critic of empiricism seems to be caught in an impossible situation. He pretenses to know something about an existence which is never presented in any experience. He seems to be talking about things to which he cannot refer and say, "There they are." If they are *there*, they belong to experience, if they are not *there*, whatever is said about them will be, not false, but meaningless. For the empirical positivist is in the fortunate position of never having to refute as false any philosophical or metaphysical proposition. He has only to say that it is meaningless because it refers to something not experienced. If it had entered into experience, it would become legitimate subject-matter, not for philosophy, but for some empirical science.

Let us see where we get, with respect to time, when we proceed on this basis. It is really quite simple. Whatever is experienced is presented. Whatever is presented is, of course, present. What is

present is neither past nor future. There is nothing but the present. Pastness and futurity denote aspects or phases of the presented, the present. What the presented present internally contains, whether it yields an experience or intuition of temporal diversity, of actual change, of a real before and after—all these are further questions which may be postponed. Did I say “postponed”? How stupid of me. For when I postpone anything, I shove it off into the future. But when I shove anything over the front boundary of the presented present, there just now is nowhere for it to go. When I postpone anything, it crashes over the precipice of existence and is annihilated. When I gently close the door of my house upon an unwelcome intruder I assume that there is real empty space in the porch beyond, eager to receive him undamaged and whole. I know of course that even an empiricist may sometimes wish to postpone something and may remind me that the entire act of postponement must take place in the presented present, and that it means the presence of ideas, leadings, and tendencies presently existent and active. If postponement has any meaning, it can only indicate something presented in experience. Past and future are either presented in experience or they are not. If they are not presented, we can neither know nor say anything about them. If they are presented, they are present and not past or future. But, I shall be told, this is a caricature of empiricism. No empiricist has ever dreamed of confining his world to the boundaries of what is actually presented. He makes inferences, he constructs tentatively and hypothetically, he projects beyond and fills in the gaps between the fragmentary bits of presented experience. On this basis and in this way he has as good a right as anyone to talk about a past and future which are not present and presented.

What is the status of such projections and constructions? From the standpoint of any present, the awareness of past and future does involve some kind of ideal construction. Now, on the one hand, such ideal construction with all of its works falls entirely within the present. The present supports the whole weight of the construction, in the shape, say, of memory or anticipation. The bridge which is thrown out to past and future has but a single pier in the present. The present, in its passage and forward movement, carries with it all the past and future. Change in the present,

which is all there is, means a change of the past. This is the view of Mead. There is behind the present no scroll of elapsed presents. Past and future have their locus in mind. Or, on the other hand, recognizing the part played by ideal constructions in the present, we shall say that they are the vehicles through which we apprehend a nonpresented but real past and future. The bridge which we construct from the present will be supported by two piers, one at each end. But the other pier falls outside the boundaries of the presented, and it seems that we would require an extraordinary kind of vehicle thus to transport us beyond the boundaries of the presented and the present. In ideal construction, we have at our disposal the resources of the present, and it becomes necessary to scrutinize them with some care.

What is the present? From any point of view which is wholly and literally encased within any present, there would be no present as a stretch of time which lies between past and future. Any present of experience viewed from within, that is, from its own point of view, is a specious present. It is specious in a different sense from that in which the term is generally used. The specious present, as employed by James, was specious because it spread over more than a momentary instant. A succession of *nows*, of which the earlier must have disappeared before the later arrive, is perceived simultaneously in the specious present of James. I shall deal with this specious present presently—that is, in some present different from this present. I am saying now that any present is a specious present unless it belongs to a temporal series which includes past and future. Any present taken by itself is a specious present. It is a real present only when it is viewed as falling between a real past and a real future. But to obtain any perspective of such a real series comprising past and future as well as present you would, apparently, have to occupy a position outside of the present. The present thus appears to be doubly specious. Within the present, you have to get your first whiff of the before and after relation, of temporal form. To do this, you must have a simultaneous awareness of succession. This present is specious in contrast with a real present, which is a durationless, momentary instant. The present is specious in a second sense because everything that can be presented must fall within the pres-

ent. The present is now specious in contrast with a real present which is viewed as occupying a position between past and future. But to survey such a present requires a point of view which transcends the present. By what right could you locate the presented in the present unless you stood outside the present and were aware of a temporal series which includes more than the present?

Wholly from within any enjoyed present, that present has no external temporal boundaries. It has no locus in time. It is dateless and tenseless. It is no present in contrast with either past or future. I am but repeating here what Santayana has so clearly seen and said. The fact of experience, from its own point of view, is groundless. Viewed wholly from within, it has no successor nor is it the inheritor of anything which has gone before. It just is, and this "is" has no tense. Santayana's further contention that nothing vouched for in actual experience can provide access to existence, temporal or otherwise, is another matter.

The situation and problem here confronting us are but one instance of the whole affair of transcendent reference, of the relation between the given and what lies beyond the given, of immediacy and meaning. The present alone is given, presented, but we could not know it as present except by reference to its position within a wider series including past and future, which are not given. Were they given, they would be present. To view the present as occupying a temporal position is already to have transcended the present. The view requires a perspective wider than any which is accessible within the boundaries of presented and present.

The solipsism of the temporal specious present is in the same boat as any form of subjectivism and solipsism. Why is it ever alleged that presented data are subjective, that they fall inside an area bounded by the limits of immediacy, so that a subsequent process of precarious inference or irrational animal faith is required to provide access to what really exists? Any subjectivist interpretation of sense data is, as Kemp Smith has said, the result of the belief that sensations are mechanically generated through brain processes. What I directly perceive is said to be mental or subjective only because an outlying field of physical objects, including my body and brain, are first realistically assumed as the causes that bring about the existence of my sensations. But then

one turns around and says that these causes, since they are not directly experienced, must be inferred or posited upon the basis of their directly experienced effects. Unless they were first apprehended as the external and objective causes of sense data, there would be no point in supposing these latter to be merely private or subjective. The belief in their independent and objective existence cannot be entirely an affair of inference from the given if that is taken to be confined to the immediate, subjective, and present.

The relation between present and past, as well as between present and future, is analogous to the relation between presented sense data and physical objects. Neither physical objects, nor past nor future, can be said to be known through inference from present or presented experience. There would be no occasion for making the inference, let alone justifying it, unless one first had an awareness of the past or of a physical world by reference to which the presented is declared to be subjective and not objective, present and neither past nor future. Unless one has from the very start an awareness of a field which transcends the present, there would be no ground for the assertion that one's immediate experience occupies a temporal present. This is the elementary and inescapable paradox of all our knowing. Ever since it found its first expression in Plato's doctrine of *Anamnesis* it has dogged the footsteps of philosophical reflection, and demanded that we settle our accounts with it as best we may. If by empiricism one means only that, since to recognize the present one must be outside the present, a field transcending the present must be presentable and therefore, after all, in some fashion presented, then of course the limits of empiricism are *ipso facto* the limits of all science and philosophy, and Plato and Spinoza are as empirical as Locke and Hume. This is surely wrong. Empiricism, if it is to mean anything definite at all, denotes an attempt to stay within the presented, to regard anything not presented either as an inference from or a projection of the presented, or posited by the exigencies of life and practice with which the criteria of knowledge are simply not concerned.

Thus, a present which stands by itself, into which something called past or future is absorbed, or which is thought to provide the sole basis from which past and future may be inferred, is a specious present. In contrast with such a specious present, a real

present would be viewed as part of a temporal series which includes more than the temporal present. Were there no awareness of such a more inclusive temporal span, all that could possibly be said would be that such and such items are presented, are being experienced, without in any way implying the present tense. If what is presented is apprehended as belonging to or occurring at a present time, it is because we are aware of something more than just the presented. What is that more than the presented which leads us to locate the presented in a limited region of a temporal series and call it a temporal present? It can only be, I think, a schema or relational structure, a type of order whose defining principle is just the relation of before and after. We apply this schema to the whole of what is presented. It then becomes known as something lodged between that which came before and that which is to come after. We apply a temporal form to the totality of what is presented. The temporal pattern is simply the transitive, asymmetrical relation of before and after. It is through the employment of this pattern that the presented—which, as such, is tenseless—is transformed into the temporal present. For this reason I think that the relation of before and after is, logically, more fundamental than the relation of past, present, and future. McTaggart's *B* series is logically prior to the *A* series. The *A* series is the result of applying the pattern supplied by the *B* series to any mass of presented experience. As we have seen, it is this which enables us to understand why we so readily think of time *per se*, of empty time, of Time with a capital T. For what is this save the bare schema of before and after? And how much do we not owe to our human interest in forms and patterns abstracted from their particular exemplifications and instances? Of course they are abstract and empty, but they are none the less fruitful. That the discernment in experience and nature of such abstractable universals is the sole basis for our knowledge of the possible, was the theme of my paper a year ago. I there held that knowledge of the really possible is the application beyond the actual of patterns and schemata, types and universals, discerned within the actual. I am now saying that our knowledge of the actually presented as a temporal present is likewise the application to the whole of the presented of a temporal form.

The temporal schema of before and after, when applied to the actually presented, discloses it as contained within a structure which transcends the actual. It discloses the presented as lying between a real past and a real future. Neither the past nor the future are actual in the sense in which the present is actual. The actual is what is being enacted. What has been and what will be enacted are not actual. But it does not follow that they are nothing real or that they are only shadows cast by the actual. This distinction between the actual and the real seems to me both inescapable and fundamental. The actual is that fragment of the real which is presented. In undergoing the conditions necessary for its presentation in experience, the real may be altered, simplified, and pared down to the scale and perspectives imposed by the exigencies of animal life. To whatever degree we may suppose this to occur, the actual is apprehended within a real context which transcends the boundaries of what is literally experienced and presented. Our awareness of that wider context is neither a literal transcript of what is actually experienced nor a sheer inference from the stuff of presented experience. Knowledge is from the very start more inclusive than literal experience of the actual and the presented. There is no better instance of this than time itself. The only time that is actual is present time. In apprehending it as present we also apprehend a nonpresented, nonactual, but real past and future. In short, our awareness of a time order transcends our enjoyment of all that is presented in actual experience. We apprehend the presented as a temporal present between a real past and a real future because we apply to the presented as a whole the relational pattern of successiveness, of before and after. It is through the employment of such relational patterns that the actual is taken as a phase, moment, or fragment of structures which transcend the actual. If the presented were merely enjoyed for what it is, as presented and given, the real would collapse into the actual, the boundaries of our world would coincide with the boundaries of the presented. Or rather, it would never occur to us to draw any distinction between our world and the world.

But what of the temporal form itself, the relational pattern of before and after? How do we come by this so as to apply it to the presented and thus transform the presented actual into a tempo-

ral present? Do we or do we not actually experience temporal succession, the relation of before and after? That we have and employ the idea of temporal order is indubitable. We use it, as we have seen, to transcend the eternal now of the presented and to convert it into a temporal present. But the results of this transformation appear to be utterly paradoxical. On the one hand, the presented actual becomes extended backwards and forwards into a real past and future. The actual is set in a wider context of the real which both transcends the actual and is continuous with it. But the time form, the relational pattern of before and after, is not only applied, in wholesale fashion, to the whole of the presented. It is also employed as an instrument in the internal analysis of the presented. Within the presented, earlier and later are discriminated. In any presented duration, change, or persistence, the distinction of before and after breaks out. No matter how short the presented span may be supposed to be, within that span there is a before and after. And what came before, the earlier, must have gone by the time the later comes upon the scene. No before and after can coexist. Existence or the actual collapses into an instantaneous durationless moment. Thus, at the same time that the presented actual is expanded into the time order inclusive of indefinitely more than the present, it is also contracted into the momentary, the durationless, the instantaneous. The application of the temporal schema of before and after to the presented has these two divergent and contradictory results. It opens the windows of the present upon the wide expanse of past and future. It also appears to shave off the edges of the presented until all temporal quality and expanse disappear. We had hoped that the temporal pattern, as something universal and formal, might provide the means of transcending the actual. It now threatens to destroy the very actuality of the presented, and to pulverize the actual present into a changeless, momentary instant. Here is a form, a categorial relation, originating in experience and then employed to condemn as specious the very experience which engenders it. I suspect that we have here stumbled upon a significant and pervasive aspect of experience, paradoxical though it be. For whence can any ideal, any thought of a possible better, arise if not from the presented features of experienced and actual situations? But

when formulated and made articulate, the ideal condemns the actual as not being what it ought to be or might be. The processes of life and experience engender forms and ideal structures which in their turn take the lead and assume mastery. They now expand and transform, even condemn and destroy the very processes in which they have arisen.

It is, then, to a present said to be specious and unreal that we are now brought. The concept of the specious present was domesticated, though not invented, by James, in the interests of psychological description. It was designed to express the fact that, in James's words, "our consciousness never shrinks to the dimensions of a glow-worm spark. The knowledge of some other part of the stream, past or future, near or remote, is always mixed in with our knowledge of the present thing."* The minimum of consciousness is a duration block. We have a direct awareness of succession, duration, and persistence. What has just gone and is now slipping away is simultaneously perceived with that which is coming in. The difficulties and contradictions which inhere in such a "specious" present are notorious. They were dealt with at length by Mr. Loewenberg and Mr. Mackay, and prompted the former to seek for a real and nonspecious present. He believed that he was on the track of the nonspecious present in the recognition of persistence and persisting things. Here is a present which is restricted neither to a durationless instant, nor to any span of successive moments which appear to be perceived simultaneously. I, too, should like to discover a nonspecious present, but I do not feel so confident that the notion of persistence offers us our best hope; for I suspect that the contradictions disclosed within the psychological specious present threaten to break out within persistence. These contradictions, or alleged contradictions, are present wherever you have the temporal form of before and after, earlier and later. But this temporal pattern is universal and pervasive. It invades duration, persistence, the present itself. The crucial urgency of this temporal relation of before and after lies in its bearing upon the question of existence and reality. Time means that anything existing, existing now, has followed upon something else which did exist but no longer exists, and comes before another something

* James, *Psychology*, I: 606.

which may or will exist but does not now possess existence. It is this temporal pattern of succession which apparently compels us to say that change and succession as experienced are specious. It also drives us to say that the real itself cannot change, cannot even endure and persist as something unchanging. The defects of the specious present are not only epistemic, involved in any awareness of temporal flux, they are also constitutive of any objective duration or persistence, characterized by the relation of before and after. For what condemns the perception of duration to be specious is the fact that any duration, however short, consists of a plurality of positions defined by the relation of earlier and later. The supposed contradiction inherent in a simultaneous perception of successive moments but translates into the language of psychology the impossibility of the coexistence of any successive moments. Of two successive moments, t and t' —related, that is, as before and after—when t exists, t' does not yet exist. And when t' exists, t no longer exists. If you are looking for existence exempt from this discrepancy, you cannot stop short of a duration so tiny that no relation of before and after breaks out within its boundaries. Such an existence is infinitesimal and has no boundaries. Within it nothing can happen.

Thus the same logic which condemns a perceived duration as a specious present must also condemn any occurrence, any objective happening, as spurious and specious. The specious present is a present the whole of which cannot exist. There are, indeed, additional difficulties in the psychological specious present. In intuited duration or change, we apprehend the passage from earlier to later. We discriminate between two phases, one of which comes before the other. But if we are to apprehend any relation, the related terms must be simultaneously discriminated. They must, together with the relation between them, be present. But the earlier is not present when the later is. This is just what is meant when it is said to be earlier. An objective occurrence is exempt from this difficulty. Two successive phases of any persisting thing need not be dependent upon any discrimination of a perceiver. But the fundamental difficulty is not thereby avoided. How much of the persistent exists now? How inclusive is a real now? If it has any finite stretch whatever, it is characterized by an internal di-

versity of before and after, which cannot exist together. If existence belongs to one moment, it is lacking in all earlier and later moments. Thus, if the span of perceived duration, the psychological present, is specious, so is the existence of any event whatever. If the specious present is condemned because successive events cannot be held together in one act of perceiving, every event must be condemned. An event takes time. It has a duration. Within that duration there is the difference between earlier and later. They cannot coexist. But both are intrinsic to the event, therefore the event cannot exist. If past events have no existence, neither can any earlier moment or aspect of a single event exist at the time its later moments transpire. The world exists momentarily at any one instant of time. It is annihilated at that instant and a new world created at the next instant of time. Events, changes, persistence, and existence beyond an instant all become equally specious.

Where have we gone astray in reaching so intolerable a result? For I assume that events do occur, things change, and something persists, and that any analysis which leads to the conclusion that such things as these are specious has somewhere blundered. The difficulty lies, I think, in our having assumed that the temporal form, the relation of before and after, taken by itself, determines the conditions of existence. All existence may well be subject to this temporal pattern, but the question of what exists is not to be answered solely with respect to the requirements of the temporal order. If the time order of before and after exclusively dominates the determination of existence, then no span of time within which there is necessarily a before and after, can exist. And if anything whatever exists beyond a momentary instant, then the time form of before and after does not exclusively determine what may be said to exist. This is to say that in every event, however short, the momentary instant is transcended. There is an existent something which spreads across a plurality of instants. This is just what an event is. Its occurrence, which is its existence, occupies a span of time within which the temporal relation of before and after may be discerned. The temporal order is a character of events, of occurrences. It is a perverse procedure to use the time form of before and after, which is an adjective of events, in such a way as to declare the original substantive event nonexistent, except that

part of the event which coincides with an instantaneous now. Unless you are willing to ascribe existence to a duration within which an earlier phase is followed by a later, you cannot so much as talk about an event, an occurrence. If the world contains such events as lightning flashes and muscle twitches, then there are existences which occupy a duration block. Lightning flashes and muscle twitches are short events. But if the world contains such events as these, I can see no grounds based upon the supposed requirements of the temporal form of earlier and later which prevent one from ascribing existence to occurrences which occupy a longer span. If there are existences which transcend by ever so little an instantaneous now, then, so far as anything about time is concerned, there can be existences and occurrences having any time span imaginable. If a lightning flash exists as a single event, so can a thunder storm, the erosion of a river bed, the evolution of the solar system. If a muscle twitch exists and occurs, then the writing of this paper, the living of my life, the rise of modern capitalism, the evolution of humanity occur and exist. My statement is hypothetical. If an occurrence so nearly momentary as a flash of lightning exists, then there is nothing which can be drawn from the purely temporal relation of earlier and later to prevent one from ascribing existence to any occurrence so long as it is one occurrence, a single individual event. I may put it in this way. It is asserted that the rise of modern capitalism cannot be said to exist as a whole because it consists of an historical sequence of events. The earlier events transpire and occur before the later events. An event has existence only when it is occurring. Past and earlier events are not occurring. Therefore they do not exist. The banking operations of the Fuggers are not now going on. But if this be so, then the same analysis must be applied to any occurring event, however brief it may be. For the relation of earlier and later, of before and after, applies to a flash of lightning just as much as it applies to the development of modern capitalism. The earlier phase of the flash has occurred and is gone when the later phase occurs. If what has gone is synonymous with what does not exist, then there can be no occurrence or existence of a lightning flash. Now I cannot see that it is incumbent upon any philosophy to prove that there do occur such events as lightning

flashes Unless such events existed, there would be no temporal order of before and after Just this is the meaning of the assertion that there is no time *an sich*, that it is adjectival to events and processes

I am compelled to conclude that the so-called and miscalled specious present is as real as any event whatever. When I listen to music, I am conscious of a duration within which I am aware of the sounds actually being heard as belonging to an entire movement or sonata. I certainly do not hear all the chords comprising the sonata in any one present. The present in which the opening chords are presented, actually heard, is not the present in which the final chords are heard The focus of actuality traverses a real entity, the whole sonata. The event which is the playing of the sonata may have a time span of ten minutes It exists throughout its entire duration The physiological and psychological rhythms of my body-mind set far narrower limits to my events, to any one actual present in my experience Hence, for me, the chords actually heard in any one present are embedded within occurrences belonging to a real event which has a duration overlapping that of any actual sounds. The real encompasses the actual and, under the temporal form, it denotes events within events, each enduring throughout its own occurrence. The existence, that is, the occurrence of events determined by my physiological mechanism and rhythm is no more specious than is the occurrence, duration, and existence of the whole sonata My awareness of what is not actually being heard is a consciousness of something not present. The total field of awareness, the whole sonata, transcends the boundaries of what is actually being heard

There is nothing, then, in the temporal relation of earlier and later which determines the boundaries of an event's existence and occurrence The temporal form cannot restrain our ascribing occurrence to existence spread out over a long time. Once the instantaneous moment is transcended, there is nothing about the temporal relation to tell us where to stop in drawing the limits of occurrent, existing events. We have now to ask what it is that does determine the boundaries of any event. What makes any event, long or short, an individual event? This is at the same time the question of the boundaries of any present. The occurrence of any

event transpires in some present. If an event is entirely over, then its occurrence took place in a present which has now become past. We are to ask, then, what is denoted by any present, by any individual, occurring event. We have seen that we get no help from the formal temporal relation of earlier and later. If we take this as a touchstone, every present and every event are whittled down to an infinitesimal instant in which nothing happens. So far as the temporal pattern is concerned, the way is open to make an occurring event and the present in which it occurs as inclusive as may be required on other grounds.

What does determine the boundaries of any present event? There are two possible answers to this question. One is that the boundaries of an occurring event are set by the so-called specious present of an observer. What is now occurring depends upon the span of time which is perceived as a present duration block. There are no natural divisions in processes as they go on. The other is that the boundaries of occurring events are intrinsic to events themselves. The event is an objective entity whose duration span is independent of any perceiver's so-called specious present.

The first of these two views is subjective. The unity ascribed to an event, the time during which it is said to be now occurring and present, is read into an otherwise continuous process. The cleavage between present and past, between what is now going on and what has occurred, is determined by the chance nature of some perceiver's time span. That acts as a cutter which slices the continuous processes of nature into present, past, and future. This theory is, I think, attended by all the difficulties which encumber any subjectivistic theory. Can we be content to make the arbitrary length of our time span the measure of the existence and duration of nature's events? An observer with a longer time span would report as now present occurrences which an observer, equipped with a shorter time span, would locate in the past. Here again, I suspect that such a view is ultimately the result of supposing that the temporal form of before and after, taken by itself, determines existence. Only, in this illustration, existence is not pulverized into a momentary instant in which there is no duration. Existence is now evenly spread over the entire series of instants defined in terms of the temporal order of before and after. Slow-moving,

continuous changes characterize the entire series. Existence is identified with the flux of continuous change and process. Within this continuous process, there really are no events, that is, no individual temporal existences which introduce natural boundaries, rhythms, and crises into the even flow of continuous process. Existence, so conceived, is indifferent to the distinction between present and past because any place in which the series is cut is wholly arbitrary. If it is introduced at all, it is only from the side of an observer and the duration of any present but reflects the contingent time span which the observer happens to have. The traditional assumption of orthodox science, that science is concerned with process and not with events, implies that in truth there are no events except arbitrarily selected slabs of process whose duration, occurrence, and existence are determined by nothing intrinsic.

How is an event distinguished from a process? A process as such may be analyzed, without remainder, into a succession of states, one after another. The temporal schema of before and after, and nothing else, is the determining form of process. Unbroken continuity both within a process, taken as something finite, and spreading indefinitely beyond its edges into past and future, is the characteristic earmark of process. Ideally, nature, when brought under this category, is one continuous process. We may in thought, or in the interests of action, slice the continuous process into segments. But there is nothing within the process itself to indicate where such cuts should be made. In such a world of continuous process, there are no events. For an event as an occurrence which has natural boundaries. It has a beginning and an end. It is individual. An event marks a discontinuity and break in the continuous flow of process. Events may be said to be embedded within process. They supervene upon process. This is only to say that the temporal form of before and after does not determine events in the same complete manner in which it determines process. If the world were nothing but process, we should have to say either that the world exists at an instant or that the entire process exists. Either existence would be pulverized to a moment or time would be spatialized and the world process conceived as spread out in its entirety in the dimension of time. It is the exist-

ence and occurrence of events which yields something between these two extremes. Events have natural boundaries within the continuous flow of process. Events are individual existences.

We may now go one step farther. In the occurrence and existence of any event, the temporal pattern of before and after is transcended. There is something that perdures throughout a succession of next-to-next moments and constitutes them phases or aspects of an individual event. When an event is viewed as an arbitrarily selected slab of process, this perduring somewhat is neglected and abstracted from. The event is regarded solely under the rubric of succession, of before and after. The event is dissolved into process. There is no event which cannot be so treated. Science is, in the large, such a description of occurrences, which views all individual events as melted in the continuous flow of process. The pattern of such description is the temporal pattern of before and after. This is what causality means for scientific description. This merging of individual, historical events with their natural boundaries into continuous process is the meaning of the statement that scientific description is not concerned with individuals.

What is it that can be said to endure from the beginning to the end of a natural, historical, and individual event? I have spoken in a previous paper of such a pervasive, enduring somewhat as a "general scheme," a "governing tendency." An event is characterized by the operative presence, throughout a span of duration, of a determining pattern whose endurance binds into an individual event what otherwise would be merely successive moments of a continuous process. What was called by Hegel and Marx a dialectical process is something of this sort. It is continuous process, characterized by the temporal form of before and after, plus the presence of dramatic, individual unities which are more than merely temporal. Accumulation, tension, transition to new individual forms and structures, crises—all these and more mark the event, one may say the dramatic character of the actual processes of nature and history. Neither nature nor life is just one thing after another, whether qualified with the familiar epithet or not. They are this, to be sure. But there are events as well as processes.

How inclusive may an event be and still be an event? Since an event marks a natural division within process and exhibits a pat-

tern other than just the temporal form of succession, it follows that the temporal relation itself provides no criterion for determining how long or short an occurrent event must be. We have seen that if we take such a temporal form as alone determinative, we shall say that existence belongs only to the present instant, or to the entire process. We either pulverize existence or spatialize time. The inclusiveness of any individual event is determined by the general scheme, the governing tendency, the operative universal of just that event. Nothing derived from the temporal form of before and after prescribes its occurrence, duration, or existence. Were the whole of nature one individual event, displaying the development of a single theme, then the whole of nature would comprise one single duration, existing in one present. For such a monism, there would be no past or future. Time would enter only as the form of existence of one single event. Time relevant to it, if indeed it could still be called time, would be one eternal present. Actuality would characterize all that is real. The nature and history which we know comprise an indefinite plurality of events. Events in the plural happen. They come into being, endure, are actual throughout their duration, and perish as actual events. But in ceasing to be actual they do not become just nothing. They are enacted and remain real. They continue to possess just the kind of existence which the time form of before and after permits. For although the time form does not prescribe the conditions of the duration or existence of events, it is a form which permits lapsed actualities, no longer actual just because they are lapsed, to inhabit the domain of the real past. The actuality, occurrence, and presentness which they once had is gone forever. But that they were once actual is no consequence of anything now imputed to them by us from the standpoint of our actual present. They had that actuality in their own right, and this is just what we mean when we speak of them as past.

The plurality and diversity of nature's events is exhibited not only in the successive supersession of her happenings, of her actualities. For every event is internally manifold and comprises constituent events. The French Revolution was one event. The existence of the French Revolution was its enactment. The enactment endured through a span of time. The Fall of the Bastille was

a constituent event of the French Revolution. And that event comprised other events—shouting, throwing stones, and battering down walls. It often happens, though not always, that the more inclusive a single event is, the more dilute and formal becomes the defining principle which marks it off as an individual occurrence. At the limit of such dilution, an event melts into process, flux, mere successiveness. But the temporal form is never wholly in abeyance. Events terminate and are followed by later events. The event, having duration, is superimposed on the bare form of succession. In the duration of events and of every present, the merely temporal relation is transcended but never absent. Whatever endures and persists, whatever is present, bears witness both to the irrelevance of the merely temporal, of sheer successiveness, and to its inescapable presence, ensuring the eventual termination of every event, including the reading of this paper.